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IN THIS ISSUE

For general reading this month, the following articles are presented: "Course of Study Construction in Industrial Education" by Verne C. Fryklund and Earl L. Bedell, "Stable Standards" by Dean M. Schweickhard, "Form for Checking Preparations for Opening School in Industrial-Arts Shops" by H. L. Stiles and "Lessons for Young Workers — XII" by Thomas Diamond.

For the drafting teacher, there are the following articles: "House Planning and Construction" by R. W. Selvidge and "Shop Drawing Board" by J. Henry Schroeder.

The machine-shop teacher will find the following interesting and helpful: "Vocabulary Study of Machine-Shop Tests" by Oswald A. Ludwig, "Machine-Shop Tests" by Fred E. Decker, "Little Giant Jack," by Edwin M. Moe and W. H. Bugg, "Hammer," by Eugene V. Clarke, "Homemade Shaper and Spindle Sander" by William L. Hunter, "Spring-Chuck Holders" by Edward N. Wallen, and "Speed Reducer for a Power Freezer" by H. C. Milnes.

For the woodworker, are provided the following: "Course of Study in Industrial-Arts Cabinetmaking — III" by W. H. Bowers, "How to Clean and Care for Paint Brushes" by Frank Brokesh, "Glue" by Clifford B. Smith, and "Photo Album or Scrap Book" by W. Ben. Hunt.

For the print shop, there are: "Silk-Screen Stencil Printing" by J. I. Biegeleisen, "Methods of Type Composition" by R. Randolph Karch, and "Keeping the Cases Clean" by D. W. Conner.

Teachers of automotives will find the following exceedingly interesting: "Automobile Trouble-Shooting Contests" by Orville W. Roberts and "Desk Light" by Robert E. Murray (made of cast-off auto parts).

For the metalworker, there are the following: "Sanitary Water Carrier for Athletic Teams" by F. H. Parrish and "Two Wrought-Iron Candleholders" by G. W. Talbot.

The electrical class will find the following interesting: "Useful Laboratory Switchboard" by W. H. Creighton and "An Electric Pyrograph" by Byron M. Taylor.

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The W-70 Jig Saw has three features which warrant your special attention. (1) It is equipped with a rack and pinion blade tensioning device which is simple in operation yet highly efficient. Can be adjusted while the machine is running. (2) It has a spring-type hold-down which may be adjusted independently of the guides, operates with the table in any position and can be varied to provide light or heavy pressure. (3) It has an air nozzle which can be adjusted separately to suit the individual preferences of the operator.

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YATES-AMERICAN

This is the tenth of a series of brief articles dealing with various woods, their properties and uses. It is our hope that they might make interesting and helpful classroom material. We will welcome your suggestions as to the species of wood you would like featured in this series.

SHORT TALKS ON WOOD

CHESTNUT *(Castanea dentata)*

A rapid growing, valuable tree which has practically been exterminated throughout its northern range by the deadly chestnut bark disease. The wood is light, soft, somewhat weak and coarse grained. Very durable in contact with soil and highly resistant to decay. Easy to work, provided it is not too dry. Grayish brown in color.

One of the most important uses of chestnut is in the manufacture of caskets. Also utilized for furniture, fence posts, interior finish, boxes and cooperage. Wood is rich in tannic acid which is used for tanning leather. The delicious flavor of the nut is well known.

Chestnut is found from Maine to Michigan and south to the Carolinas and Georgia and Arkansas. Makes its best growth on rich, well-drained soil. Grows rapidly. In the forest, it has a tall straight trunk free of limbs and a small head. When not crowded has a low, broad top. Reaches a height of 60 to 70 feet and a diameter of 15 to 30 inches.

The bark on the trunk of small trees is dark gray and smooth. On old trees it is thick and divided by shallow furrows into broad, flat ridges. The leaves are simple, alternate, five to ten inches in length, sharply toothed and yellow-green in color. The fruit is a prickly burr, usually containing three sweet, edible nuts.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

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Course of Study Construction in Industrial Education

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This article shows the application of the principles laid down last month to the subject of Household Mechanics.

This article parallels the previous article on course construction and revision by the same authors which appeared on page 261 in the preceding issue of this magazine. Statements in the earlier article cover, in their relation to course building, (1) orientation, (2) determination of aims, (3) selection of content, (4) methods of instruction, (5) evaluation of results, (6) texts and references, and (7) supplementary services. These points are presented here in their relation to course building in household mechanics for the elementary schools. The same principles of course construction presented here are used in all course construction and revision procedures in industrial education in Detroit. Details that would be presented under point 3 have not been included here because of their space-consuming nature. However, analysis of activities determines the identification of content in relation to aims and methods.

Time Allocation and Equipment

Industrial-arts instruction in Detroit, in grades seven and eight, has been organized around the household-mechanics concept. The time allotment is 165 minutes per week; this is usually divided into one 99-minute period and one 66-minute period. It is the common practice to use the 66-minute period for drafting and planning.

The equipments in the various shops of the elementary schools are limited to hand tools, with the exception of some small power-bench grinders. A few schools have each a jig saw or a wood-turning lathe. The hand equipments, without the power-driven machinery, are fully adequate for covering the content of this course of study in the terms of the aims set forth. Adequate supplies are furnished for handling the core jobs. In order that teachers may plan their lessons in accordance with the available equipment and supplies, standard lists appear in the appendix of the copy of the course in possession of each teacher. The standard coded list of available supplies does not appear in this paper.

Aims — General Aims of Education

Perhaps the best known set of educational aims are the seven cardinal aims of the committee of the N.E.A., which committee made its report in 1918. Through the years no other of the many proposed aims have been as acceptable nationally as this set of aims. The work of such committees cannot readily be repeated, and new aims established as frequently as may seem necessary even though, from time to time, social-economic changes suggest need for reconsideration and revision of the concepts, beliefs, aims, and practices in education in terms of current needs. Demand for action of national consequence in effecting changes usually develops among the people and eventually, by general request, receives the attention of those who establish policies for the nation as a whole. This would hold true in reconsideration and revision of the seven cardinal aims. They have served well for twenty years, and they are still the major aims in many areas of the nation. However, social-economic changes take place at different rates in the various areas of the nation because of local conditions. Changes quite unlike those taking place in many other parts of the country have been in evidence in the area surrounding Detroit. And it is probable that a set of general aims for the nation as a whole would not be as valuable to this area as would a set of general aims conceived according to current social-economic conditions and consequent educational needs.

It should be kept in mind that educational policies are conceived as a result of the interaction of the thinking of lay people and professional educators. There comes a time when group thinking crystallizes and leads to action in the interests of all the groups concerned. Therefore, strong need for newer considerations of the purposes of education in Michigan lead to the formulation of a set of aims that seem today to have more vital meaning to this area than would any other general aims. The goals of public education in Michigan were formulated by the Michigan Educational Planning Commission in 1934, and appear now, in general, to guide the educational planning in this area.

Inasmuch as the cardinal aims of education still have a place in the minds of Detroit educators, even though educators embrace rather fully the more recent goals of education in Michigan, it seems advisable to include the older aims when establishing general aims for constructing a course of study. Therefore, both sets of aims have been taken into account in constructing this course in household mechanics. They are here enumerated:

Seven Cardinal Aims of Education

1. Health — a sound mind in a strong and healthy body.
2. Command of fundamental processes — ability to read, write, think, study, and act.
3. Worthy home membership — a happy, unselfish, and democratic home life.
4. Vocation — knowledges and skills needed to earn a living.
5. Civic education — an informed citizenship dedicated to the common good.

6. Worthy use of leisure — use of free time for worthy activities and pleasures.
7. Ethical character — high spiritual character that is trusted and admired.

Goals of Education in Michigan[1]

1. To cultivate a deep regard for democracy and an intelligent appreciation of democratic institutions.
2. To develop those qualities of character which are of special significance in a democracy.
3. To develop the willingness and the ability to cooperate effectively in a democratic society.
4. To develop the ability to use the most effective and reliable methods in searching for truth as a basis for the discovery and solution of problems.
5. To develop the effective use of the fundamental knowledge and skills required by all.
6. To insure an abundant social and individual life in accordance with each individual's capacity and ambition.
7. To provide training in the specialized and professional services which are requisite for society.
8. To provide for the enrichment of adult life.
9. To plan for the continuous appraisal and readjustment of the educational program to fit changing conditions.

Aims of Industrial Education in Detroit

It has been stated in the previous article, already mentioned, that the general aims of education are intended to be curriculum or general school aims. They are assumed to indicate what should be fostered by all education. They were not intended as aims of specific subjects. It is necessary, therefore, to particularize the general aims for an area and the subjects within the area. There should be general aims for industrial education conceived in harmony with the aims of education. All subjects in an industrial-education program should contribute together toward realization of the area aims. The area aims would be too general for use as specific subject aims.

The aims of industrial education in Detroit conceived in harmony with the aims of education are:

1. To develop interests in and understanding of the place of industry, its materials and processes, in social economic life.
2. To develop consumer's knowledges which involve ability to select wisely, care for, and use properly various industrial products about the home.
3. To foster appreciation of good workmanship and good design in industrial products.
4. To develop safe work habits and attitudes of respect for hygiene and safe work practices in the preservation of human resources.
5. To further the growth of problem-solving attitudes as experienced in creating industrial products.
6. To inculcate ideals and attitudes of readiness to assist and to cooperate with others in industrial shop activities.
7. To foster the growth of effective individual work habits through cheerful, orderly, and methodical performance of any chosen or assigned tasks.
8. To provide experiences of value in awakening the interests and in creating intelligent understanding of industrial occupations.
9. To develop knowledge and understanding of drafting and the interpretation of working drawings and diagrams.
10. To develop wholesome leisure-time interests in industrial materials and processes.
11. To provide training in occupational skills in keeping with maturity, aptitudes, and interests.
12. To foster appreciation of the contributions of science to industrial progress.

Aims of Household Mechanics in the Elementary Schools

Inasmuch as the general aims of industrial education were conceived for the whole industrial-education program rather than for a single industrial activity, there remains need for formulating the aims for household mechanics as a subject in the general area of industrial arts in the elementary schools. This set of aims gives direction and marks the end of action, and outlines the contribution of this offering to the general goals of education in terms of ideals, attitudes, appreciations, and skills. The course content presented for household mechanics, was chosen so that the problems and the fundamentals contribute to the realization of these aims. Methods of teaching would modify the emphasis and the successful contribution to these specific aims, which follow:

1. To develop interests in and understanding of the materials involved in household mechanics, their sources, characteristics, values, and uses.
2. To develop ability to make changes in the more common materials of industry to make them conform to needs of the household.
3. To learn to select wisely, care for, and use properly industrial products that are related to the maintenance and comforts of the home.
4. To foster appreciation of good workmanship, good design, good materials, and good structure in the creative experiences in household mechanics.
5. To develop habits of doing things properly in the interests of safety and hygiene for one's self and for others.
6. To provide opportunities for developing independence in planning wisely and following through to successful completion individual and group projects.
7. To inculcate ideals and attitudes of readiness to assist and to cooperate with others in the group activities of household mechanics.
8. To develop habits of cheerful, orderly, and methodical performance of the various tasks involved in upkeep of the home premises.
9. To provide experiences that would awaken interest in and create intelligent understanding of occupations related to the activities of house maintenance.
10. To learn to make and read simple drawings and diagrams for use in planning and in construction.
11. To encourage development of hobby interests.
12. To study the contributions of science, its men, materials, and history in relation to the activities of household mechanics in the elementary school.

Content

As mentioned in the preceding article, which appeared in the September issue of this magazine, the analysis technique is used in determining content in all course construction and revision in industrial education in Detroit. The content for this course of study was selected from analysis of the activities involved in household mechanics. Each unit was evaluated in terms of the contribution that it should make to the realization of the aims of the course provided that instructional methods also conform to the emphasis indicated by the aims. The content is set forth in terms of instructional units that cover operations and information topics in their relation to application in typical household-mechanics jobs.

Methods of Instruction

The attainment of desirable outcomes is limited to a considerable degree by methods of instruction. The list of instructional units may be chosen with the knowledge that they would involve the experiences which would make full contribution to the realization of the aims. However, the methods of teaching rather than the list of learning units would control the ultimate attainment of desired outcomes.

Prescription of specific methods of instruction that would meet all instructional situations according to individual differences of learners and teachers would have doubtful place in a course of study. There are many situations where the teachers should be ready to match individual needs with ready instructional techniques, aids, and devices. There probably is not a best method that can be used as a pattern for all, but there are many proved principles. Perhaps a good understanding of how learning is assumed to take place would be among the first of the principles involved in teaching. A working knowledge of educational psychology, therefore, would be of considerable value in helping the teacher in forming judgments with regard to teaching techniques.

Demonstration

Perhaps no other of the many devices and techniques of teaching is more effective than the demonstration. Each unit of instruction of manipulative nature, and listed specifically in the course of study in the section on content, represents a fundamental instructional unit to be demonstrated. The outcomes expected of each demonstration would be limited by the aims, and whether the emphasis would be on appreciation or on skill. In the elementary school, appreciation would precede skill in importance. However, it goes without saying, that there are standard ways of performance that, of necessity, must be followed in order that safe and effective work habits may be established and that costly equipment and materials

[1]For detailed study, see *Instructional Guide for Elementary Schools*, Bulletin No. 301 (1936), Department of Public Instruction, Lansing, Mich.

can be used economically. The need for system and organization in shopwork is manifest in these requirements.

The teacher should be a master of the technique of the demonstration. The following are the principles involved in an effective demonstration:

1. The learner should know what he is expected to learn and the teacher should know the outcome expected.
2. The teacher should plan the demonstration carefully in step-by-step order.
3. All materials and tools necessary for the demonstration should be checked carefully and arranged for convenient use at the bench.
4. Teach one fundamental procedure at a time.
5. Incidental or correlated information of procedures of spontaneous nature should not be brought in to complicate a demonstration.
6. Pupil needs should limit the frequency of demonstration, and immediate use should indicate the exact time for presenting a demonstration.
7. The demonstration should be presented as quickly and as clearly as possible. Fifteen minutes should be a good average time limitation.
8. The teacher must show a high quality of workmanship in order that high ideals of accomplishment can be set for the learners.

Instructional Aids and Devices

Teachers should be constantly alert to opportunities for effectively coping with individual differences in learning. Varieties of teaching aids and devices that would stimulate individual learning without requiring group demonstrations are necessary for effective general shop instruction. Teachers should prepare, and exchange with one another when possible, instruction sheets, charts, drawings, models, and other aids and devices that would be helpful in improvement of instruction. The more effective the instruction, the more certain would be the attainment of aims.

Job Sheets. Long experience shows that no other kind of instruction sheet is as helpful in instruction and management in the large classes in household mechanics as the job sheet. It is a valuable teaching aid and in no way should it be considered a substitute for the teacher's instruction. Instruction covering fundamentals is not assumed in a job sheet, and therefore the teacher must supply the necessary instruction.

The job sheet has definite relation to the plan of procedure with the exception that it is in permanent form, usually sold commercially, while the plan of procedure is made by the pupil. Both devices follow similar outlines. The commercial job sheet is available and appears in the list of approved industrial-arts texts for Detroit.

An important feature of the job sheet is the plan for appraisal of the pupil's work. This facilitates evaluation of work on a subjective basis. It is important to check (1) the time required in doing the job, (2) the quality of work, (3) the understanding of the work that was done, and (4) knowledges related to materials, tools, and economic aspects of the job.

Management

Any method or combination of techniques of instruction that could be used in teaching household mechanics in large measure depends for success upon good management. Good management makes possible the routine movements of the pupils so that a maximum amount of liberty is permitted. Good management helps to create an atmosphere of active interest and industry. Good management and effective instruction are indispensable correlates in shop instruction. There are five essential conditions that lead to a strong working relationship of management and instruction. They are (1) stimulation, (2) planning, (3) execution, (4) self-appraisal, and (5) generalization.

1. *Stimulation.* There must be an arousal of a pupil attitude of purposing or desire to create and to learn. There are many ways to stimulate readiness. Among them are:

a) Teacher's ideals and attitudes of leadership.

b) Pupils' proposals of projects that stimulate the class interests.

c) Variety of suggestive projects exhibited in the shop.

d) Illustrations in books, magazines, drawings, and pictures.

e) Needs of the school, home, and friends.

f) Personal interests of the pupils.

2. *Planning.* One of the most valuable contributions that the teacher of any subject can make toward the education of young people comes through teaching the pupil how to plan procedures for their projects. To complete a shop project successfully it is necessary to interpret or read working drawings and to plan procedures. Learners if given the proper instruction and guidance can readily learn how to plan procedures from a working drawing.

The learner should use the plan of procedure as a guide in doing his work. Each plan of procedure, before a job is started, should be reviewed either through group discussion or with individuals. Mistakes in procedure can be discovered and prevented through such review. The learner will enjoy his work, and the resulting satisfaction will be more lasting if he proceeds with a sure knowledge of how and what is to be done.

3. *Execution.* The actual performance of the steps in the plan of procedure constitutes the work at the bench. It is by actual performance that the pupil has the opportunity to manipulate tools and use materials and, in consequence, gains the satisfaction of creating from a plan. The success of this portion of the work will depend in large measure (*a*) upon the teacher's demonstration of operations and (*b*) upon the pupil's planning. The pupil should be encouraged to revise or alter any plans that would not function in actual practice.

It is important that the planning be well done. The teacher should give instruction on how to plan just as he would give instruction covering a tool procedure, but there should be limitation to the time spent on planning so that the major portion of the time will be devoted to carrying out the plans of construction at the bench.

4. *Self-appraisal.* The pupil's evaluation of his own work is essential to the building of ideals and attitudes of industry that will lead to successful achievement. There are many ways by which a pupil may appraise his work, and there are several factors that should be taken into account in making an appraisal. Four important factors are:

a) Does the project function? Does it serve the purpose for which it was constructed?

b) Is the quality of workmanship suitable to the job — as to thoroughness, general appearance, design?

c) Is the work the result of the learner's own plan? How much of the work should be credited to the suggestions and help of others? How much time and effort was spent with other members of the class? All these points may be summed up in the question — "How efficiently did the learner work?"

d) Does the work show improvement over previous work?

Every student should have the experience of judging his colleagues' work and of being judged by them. But student appraisals should not be final. The appraisals should not be allowed to pass unchallenged by the teacher. The maintenance of fair play, honesty, sincerity, and accuracy demands that the teacher shall be the final judge of all things in the shop. These standards can be upheld in any shop if the teacher will review *all final appraisals* and sign them as an evidence of good faith.

5. *Generalization.* Transfer of the learning to subsequent application in new situations in the school and in situations outside of the school is one of the important implications of generalization. It must be kept in mind that the aims of the course qualified in terms of ideals, attitudes, appreciations, and skills, and the method of teaching should indicate the expectation of transfer. If the emphasis is on appreciation in addition to ideals and attitudes, as in the elementary school, it would seem that skill would not be among the achievements to be transferred in large degree.

Relatively few experiences can be given in the elementary school in the manipulation of tools and in the use of materials. The pupils are immature. Therefore, development of skill can only be a minor expectation. An important attainment would be the development of desirable attitudes and high ideals that would stimulate the purpose to do, the desire to improve, and the ability to apply to other situations the knowledge and ability gained. The development of these ideals and attitudes would be of greater importance than would be the development of high degrees of skill in manipulation. If the development of worthy purposes, high ideals, and proper attitudes have been stimulated through good instruction and management, skill in some degree would be at least among the concomitants if not among the direct learnings.

Testing, Evaluation, Records

In addition to the learner's self-appraisal, there seems necessity for a testing program. When skill of manipulation is among the less important outcomes, measurement of skill can well be left to the teacher's observation. Individual differences in ability to achieve would be important in considering attainment of skill.

Perhaps most emphasis in a testing program in industrial arts should be on evaluation of knowledge and understanding. The objective types of test questions used formally or informally serve well for

such evaluation. There are many types of test elements that can be conceived. Effort should be made to test ability to apply rather than to recall the learnings. Frequent informal tests are valuable in supplementing the formal objective testing program.

The Detroit Household-Mechanics Test

The Inventory Test. At the beginning of each semester an inventory test in household mechanics, Detroit Form, is provided for the incoming 7B's. This test is a valuable guide to the teacher because it will indicate the capacity or ability of each pupil in terms of the pupil's advance knowledge of the subject matter to be covered in household mechanics. The teacher will be able to adapt the work at the very beginning to suit the immediate needs of the class. The test has proven to be a strong incentive to the pupils as they are given a general overview of the entire course at the very beginning.

The Final Test. At the end of each semester a final test in household mechanics, Detroit Form, will be provided for the 7A's. These pupils will have completed their year's work in the household-mechanics course. A test given at this time could serve as a measure of the pupil's accomplishment during the period of instruction in household mechanics, but the greatest service rendered by such a test is to the teacher. A careful analysis of the results will enable the teacher to locate weak and strong points in previous instruction. Thus enlightened the teacher can modify the instruction with future classes to obtain equally satisfactory results with all units of subject matter.

Records. Recommendations for a particular system of grading seems unwise in the absence of objective proof of superiority of one system over another. However, records of work accomplished, progress charts, test results, teacher's and pupil's appraisals all should be combined in final evaluation of a pupil's accomplishment.

There is no sequence of units of work in a general shop; the student may start with any unit of work, electrical, metal-working, or woodworking. Within a unit the jobs must be done in sequence. The student may complete one job or he may complete several jobs in a given unit.

Degree of Attainment

In industrial education, the specific statements of fundamentals with suggestions for core jobs and the statement of aims in terms of ideals, attitudes, appreciations, and skills indicate the relative attainments expected of the learners. In activities where units are stated in more general terms than are those in industrial education, it seems necessary to list the expected attainments by providing auxiliary statements of limitation. For example, a unit covering the study of cereals in the Middle West would need a statement of expected attainments in the time allotted for the project because of the wide implications of coverage that such a topic would suggest. Specific statements as provided by the activity-analysis technique in industrial education, the nature of the work and individual differences make auxiliary statements of attainment in industrial arts seem unnecessary.

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Stable Standards

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Tendency to Glorify the Past

The annual concentration of attention on the constitution of the United States is an occasion throughout the entire country for reviewing the events which occurred more than one hundred fifty years ago, in connection with writing and signing that important, history-making document. When we dwell upon the excellent qualities of things such as this that were accomplished in days gone by we are likely to enshroud the past with a halo of glory which seems to be lacking in present-day affairs.

After all, however, it is not the past which we should glorify, nor even the people of the past themselves. Rather we should prize the qualities of life and the principles of living which enabled them to create and preserve for us the things we cling to as anchors in the turbulent sea of life. Our tendency to identify qualities and principles with the people who possessed them is merely another indication of our inability to think in the abstract without association with some material form or physical being.

Why should we be inclined thus to glorify the past in contrast with the present? The answer is to be found chiefly in the fact that time does much to make weaknesses and mistakes fade into oblivion, while the good and beneficial results are the ones which endure and stand before our eyes. As in the construction of a building, scaffolding is finally taken away, and the architect's vision of the finished structure stands forth. We cannot see all the muscle tension, feel the perspiration, nor hear the discordant notes that were incident to the construction. Without the vivid realization of these things we are likely to conclude that the beautiful structure came into being without them.

Likewise in reading, or even studying our country's constitution, we are all too prone to look upon it as the sudden creation of a group of inspired men who brought it into being without the attendant pangs of agony and dissension. So while we do our forebears a seeming honor by forgetting their frailties, we do them an injustice by failing to remember that their creations, which have stood the test of time, were brought forth only through the exercise of strong and enduring traits of character.

A valuable truth for consideration by student as well as by the instructor.

Apparent Decline of Standards

As a corollary to our tendency to glorify the past, we often find ourselves falling prey to the gloomy feeling that the standards of today are superficial and insecure. Observing an article made of pressed metal, which was formerly cast in heavier form, is likely to make us feel that the standard of quality has been sacrificed for price, speed of production, or some other modern demand. To change from the rigid mortise-and-tenon joint to the dowel type of construction has given many a shop teacher a feeling of despair and discourage-

ment because of the belief that standards of quality, craftsmanship, and human effort have declined. Similarly in matters of commercial design, personal attire, human conduct, and social convention there often appears a note of skepticism regarding comparative standards from one generation or decade to the next.

The teacher who resists adopting a new course of study or accepting a new project may try to cover his conservatism, even in his own mind, by attempting to show that standards are being broken down. As a matter of fact his real motives are probably more deep-seated and less worthy. On the one hand he hesitates to put forth the actual effort he knows will be required in making the change. On the other hand he is possessed with fear lest someone should criticize his new attempts in contrast with those which have already been accepted. And so he takes up his defense behind the fortification of standards.

Such attitudes on the part of teachers, or any others who look upon change as a downward step, are not constructive but are adding their bit to the growth or spread of pessimism. Those who become pessimistic over what they believe to be declining standards, have failed to realize that the only real ground for pessimism, in any time or place, lies in surrender to the forces of fatalism, despair, futility, and moral cowardice. The conflict, within the individual or in society, between rigid adherence to the old, and sudden adoption of the new and untried is accompanied with a certain sense of insecurity.

Stabilizing Forces

Apparently this conflict is not a product of the depression, nor even of the twentieth century, for from among the seasoned admonitions of previous generations there comes the adage: "Be not the first by whom the new is tried, nor yet the last to lay the old aside." There seems to be the suggestion here of the desirability of being moderately progressive, always retaining the elements of good in what has been, and applying them in modified form to what may be.

If this sounds like impractical theory one need only turn to some actual situations in the material world of industry to find that such procedure often means the difference between success and failure or even between life and death. The construction of subways or other subterranean work usually requires that men work under greatly increased atmospheric pressure. Going into or coming out of these chambers is accomplished, without human injury, by passing through successive changes in atmospheric pressure rather than by a sudden change from one extreme to another, or attempting to maintain identical pressure under unlike circumstances.

In too many instances the chief value of industrial arts has been looked upon as that of material application. More truly it should be looked upon as a field where lessons can be learned from the indisputable evidence of material things and the operation of physical laws. These lessons, if well learned, can be applied in the realm of industrial practice, but still more important can lay the foundation for more stable living individually, socially, economically, politically, and nationally.

The Cornerstone of Democracy

All the branches of education involving physical achievement or material product seem to possess a quality which fixes more securely in man's mind the principles of living which their accomplishment has required. The greatest Teacher of all time used material symbols to teach spiritual lessons, and through such use they became instruments of real and lasting value.

Even though the schools of today may possess many features which differ from those of former times, the education which they furnish must be perpetuated on the same fundamental principles. It cannot be allowed to become the instrument of propaganda or special privilege, but must be kept bright with the purpose that the youth of each generation may become grounded in the ways by which men must live if they are to enjoy a reasonably stable existence.

The stabilization of standards does not mean that they shall never change, but rather that through times of modification they shall remain unshaken. The pilot of a ship may change her course by means of a firm hand on the wheel, but if she is a seaworthy craft that does not make her less stable. Also at this time of the year the leaves of a tree change color, and soon shall fall, but the roots hold just as firmly as ever in the earth. Furthermore, it is only through continuing to derive strength from the ground, and resisting the forces of wind and weather, that leaves and fruit may again be produced as one generation follows another.

The success of democracy depends ultimately upon intelligent thinking and constructive participation on the part of the individuals who go to make up its people. Education is democracy's most powerful defense, but it must be wisely conducted on the basis of standards which have demonstrated their stability, with constant modification and adaption to new and changing conditions.

House Planning and Construction

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Giving architectural-drawing courses direction and interest.

Courses in architectural drawing usually are based upon some previous work in which certain elementary skills in the use of drawing instruments have been developed, and in which the principles of projection have been taught. The application of these to architectural details, and the presentation of structural arrangement, gives a wider application to the principles and adds to the pupil's understanding of, and interest in house construction. In general, however, so much emphasis is placed upon skill in rendering that insufficient time is left for considering the more valuable and more interesting problems of planning and construction from the standpoint of the owner. In view of this, it might be well to consider a relocation of the larger emphasis, with a view of giving the course a broader general value.

One of the most universal interests of young people and even those of middle age is the planning of a home. Such planning as they are interested in does not involve any great skill in architectural drawing. They are interested in being able to read plans and wish to know about such things as selection of site, estimating costs, architectural styles, desirable room arrangement, usual size of rooms, location and size of windows, size of doors, required room for stairways, advantages and disadvantages of different types of heating plants, problems concerning plumbing, desirable materials, business arrangements, and a host of other things. The outline given includes, in a classified arrangement, questions which have arisen in connection with an extensive building experience and in consultation with a great number of people who were interested in building homes. The outline is an orderly arrangement of the problems which should be considered by anyone who contemplates building. It is obvious that very few of these points could be answered definitely without considering a great many others.

In giving such a course, it is necessary to assemble and make available adequate information on the various topics. Care

must be taken not to attach too much weight to advertising material. While claims made by advertisers may be literally true under certain conditions, such conditions are not always present. Another thing to keep in mind is that it usually is not wise to accept at once the novel or spectacular. Sound style and sound construction are slowly developed.

Outline

I. *Why Build*
- 1. Does it pay to build?
  - *a*) Taxes, depreciation, upkeep, insurance
  - *b*) Permanent residence, increase in values, satisfactions, investment

II. *Selection of Site*
- 1. Personal considerations
  - *a*) Convenience to business
  - *b*) Transportation facilities
  - *c*) Opportunities for children
    - (1) For play
    - (2) For school
    - (3) For church
  - *d*) Frontage
  - *e*) Health
  - *f*) General service
    - (1) Electric
    - (2) Gas
    - (3) Water — including fire service
    - (4) Sewers
    - (5) Streets
    - (6) Postal, telephone, and deliveries
- 2. Social considerations
  - *a*) Similar interests of community
  - *b*) Similar social standing
- 3. Financial considerations
  - *a*) Physical condition of site
  - *b*) Present value of site
  - *c*) Probable increase in value
  - *d*) Value of site in relation to cost of house
  - *e*) Restrictions
  - *f*) Character of houses in district
  - *g*) Type of house you wish to build
- 4. Purchasing procedures
  - *a*) Financing
  - *b*) Abstract of title
  - *c*) Deeds of trust or mortgages

III. *Planning the Site*
- 1. Drainage
- 2. Location of buildings
- 3. Landscaping
  - *a*) Gardens
  - *b*) Plantings
  - *c*) Trees
  - *d*) Walks
  - *e*) Drives

IV. *Some General Considerations*
- 1. Approximate limit on investment
- 2. Methods of estimating cost
  - *a*) Cubage
  - *b*) Square foot
  - *c*) Contractor's methods — example
- 3. Materials
  - *a*) Stone
  - *b*) Brick
    - (1) Solid
    - (2) Veneer
  - *c*) Terra-cotta block with plaster
  - *d*) Plaster on laths
  - *e*) Concrete block
  - *f*) Frame
    - (1) Clapboard
    - (2) Wood shingle
    - (3) Composition shingle
  - *g*) Roof
    - (1) Tile
    - (2) Slate
    - (3) Composition shingles
    - (4) Metal
    - (5) Wood shingles

V. *Styles or Types of Domestic Architecture in America*
- 1. Colonial
  - *a*) New England
  - *b*) Southern
  - *c*) Germantown
  - *d*) Williamsburg
- 2. English
- 3. Dutch
- 4. Spanish or Mission
- 5. Bungalow
- 6. The square house, or hip-roof type

VI. *Selection of Type*
- 1. External and artistic considerations
  - *a*) Size and character of site
  - *b*) Trees
  - *c*) Direction of frontage
  - *d*) Types of neighboring houses
  - *e*) Climatic
- 2. Personal and administrative considerations
  - *a*) Number in family
  - *b*) Small children, adults, or aged
  - *c*) Conditions of administration

VII. *General Principles in House Planning*
- 1. Economy of effort in administration (Ease and smoothness at all times — conveniences for guests arriving)
- 2. Privacy of family life
- 3. Public or social phases
- 4. Service
- 5. No freaks
- 6. Consistency in style

VIII. *Features to Be Considered*
- 1. The porches
  - *a*) Stoop
  - *b*) Living porch
  - *c*) Service porch
  - *d*) Sleeping porch
  - *e*) Pergola
- 2. The entrance
- 3. Halls
- 4. Reception room
- 5. Living room
- 6. Study or den
- 7. Dining room
- 8. Breakfast room
- 9. Kitchen — size and location of fixtures and equipment, ventilation
- 10. Pantries and refrigerator room
- 11. Bedrooms — size, location of openings
- 12. Closets
  - *a*) Linen
  - *b*) Coat
  - *c*) Storage
  - *d*) Room closets
- 13. Bathrooms — kind and location of fixtures, towel and medicine cabinets
- 14. Stairs
- 15. Servants' rooms
- 16. Lighting
  - *a*) Natural and artificial
  - *b*) Convenient outlets
- 17. Ventilation, attic
- 18. Insulation
  - *a*) Attic
  - *b*) Walls
  - *c*) Openings
- 19. Windows
  - *a*) Number of windows
  - *b*) Double hung
  - *c*) Casements
  - *d*) Large or small panes
- 20. Doors
  - *a*) Outside
  - *b*) Inside
  - *c*) French
- 21. Floors
  - *a*) Living room, bedrooms
  - *b*) Kitchen
  - *c*) Bathroom
- 22. Basement
  - *a*) Entrance
  - *b*) Lighting and ventilation
  - *c*) Storage
- 23. Laundry
- 24. Plumbing — type and location
- 25. Water supply — city or private
- 26. Heating
  - *a*) Type of plant
  - *b*) Air conditioning
  - *c*) Furnace room
  - *d*) Fuel bin
- 27. Special features
  - *a*) Built-in furniture and fixtures
  - *b*) Fireplaces
  - *c*) Ash chute
  - *d*) Clothes chute
  - *e*) Use of attic space

All of the foregoing should be abundantly illustrated by photographs and sketches.

IX. *Starting on the Plan*
- 1. Make a list of all the things you want
- 2. Make a list of all the things you *must* have
- 3. Make preliminary sketches showing general arrangement of rooms drawn approximately to proportion
- 4. Use cross-section paper with ⅛-in. squares. Count two squares to each foot
- 5. Lay out first floor — extreme dimensions
  - *a*) Lay out arrangement of rooms to scale, allowing for thickness of all walls
  - *b*) Arrangement of rooms and porches
  - *c*) Location and size of doors and windows
  - *d*) Location and space required for stairs
  - *e*) Location and space required for chimney
- 6. Second-floor plan (tracing paper)
  - *a*) Must fit first floor
  - *b*) Chimneys, stairs, etc.
  - *c*) Dormers
- 7. Basement (tracing paper)
  - *a*) Furnace room
  - *b*) Fuel room
  - *c*) Laundry
  - *d*) Cold room
- 8. Roof plan
  - *a*) Ridge — hip — valleys
- 9. Elevations
  - *a*) Project from floor plans
  - *b*) Story height
  - *c*) Roof — pitch, etc.
  - *d*) Height of windows and doors

Construction

I. *Basement*
- 1. Laying out site
- 2. Excavations — care of trees — top soil — grading
- 3. Drainage
- 4. Material
  - *a*) Concrete
  - *b*) Brick
  - *c*) Stone

  } Relative cost, thickness, value, etc., of each
- 5. Footings — bearing — width — thickness — reinforcement
- 6. Walls above and below grade — inside
- 7. Waterproofing — foundation drainage
- 8. Floors
- 9. Areas

II. *Superstructure*
- 1. Frame
  - *a*) Termite proofing
  - *b*) Anchoring to foundation
  - *c*) Floor framing — joists — girders —

bridging — headers — trimmers
d) Studding — size — distance apart — bridging — length — through to girder
e) Partitions
f) Window and door openings — size — truss — sliding doors
g) Casements and French doors
h) Stairs — stringers — rise and treads
i) Second-floor joists
j) Ceiling joists — plates
k) Attic
l) Roof framing — size of rafters — bracing, etc.
2. Roof
a) Wood shingles
b) Metal
c) Composition — asbestos
d) Slate
e) Tile
f) Sheathing — paper, etc.
g) Flashing — counterflashing — hips — valleys — dormers — chimneys — gutters
h) Insulation
3. Kind of wood for outside work

III. *Frame Structure*
1. Sills and studding
2. Kinds of sheathing
3. Insulation
4. Siding
5. Shingles
6. Plaster
7. Window and door frames — details for weather protection
8. Cornice — details for weather protection
9. Windows and glazing

IV. *Brick*
1. Brick veneer
a) On frame
b) On tile
2. Solid brick
3. Hollow wall
4. Thickness of wall
5. Bond
6. Joints
7. Mortar
8. Doors and window sills and heads
9. Weatherproofing
10. Anchoring and anchoring plates
11. Partitions

V. *Stone*
1. Kinds of stonework
2. Bond — bed, etc.
3. Veneering
4. Mortar and pointing
5. Doors and window sills and heads
6. Weatherproofing
7. Anchoring and anchoring plates
8. Partitions

VI. *Plastering*
1. Furring
2. Lathing
a) Wood
b) Metal
c) Sheet lathing
d) Corner beads — joining masonry work
3. Grounds
4. Materials (lime — sand — hair — patent)
5. Number of coats — how applied
6. Finish — bath — kitchen

VII. *Floors*
1. Rough floor
2. Paper — deadening felt
3. Kinds of flooring
a) Pine — slash grain — vertical grain
b) Hardwood — oak — red or white — plain or quartered — maple — beech — birch
4. Dimensions and methods of laying
5. Kitchen — linoleum — rubber tile
6. Bath — linoleum — tile — rubber tile
7. Finishing
a) New floors
b) Old floors

VIII. *Trim*
1. Base
2. Door and window casing
3. Structural features
a) Paneling
b) Cabinets and cases
c) Seats
d) Molding — cornices

IX. *Doors*
1. Size
2. Style
3. Hanging
a) Double acting
b) Folding
c) Sliding

X. *Windows*
1. Casement
2. Double hung
3. Weather strips
4. Storm windows
5. Screens

XI. *Painting*
1. Outside
a) Material
b) Number of coats
c) Roof
2. Inside
a) Stain, paint, or enamel
b) Protecting or filling coats
c) Methods of application
d) Floors
e) Walls

XII. *Hardware*
1. Kinds
2. Approximate cost

XIII. *Chimneys and Flues*
1. Fireplace (detail)
2. Size of opening and flue
3. Dampers
4. Protection
5. Height of chimney

XIV. *Plumbing*
1. Permits
2. Drains
3. Roughing in (testing)
4. Fixtures
a) Lavatories
b) Stool — tank or flushometer
c) Bathtub and shower
d) Laundry tubs
e) Sinks
f) Drainboards
g) Vents
h) Traps
i) Cleanouts
5. Water supply
a) Size of pipe and pressure
b) Noise — cushions
c) Faucets
d) Hose bibs
e) Valves for cutting out fixtures
f) Stop and waste
6. Hot water
a) Tank and range
b) Coal heater
c) Gas heater
d) Furnace
e) Automatic

XV. *Lighting*
1. Location of lights
a) Living room
b) Dining room
c) Bedroom
d) Kitchen
e) Closets
f) Porches
g) Basement
2. Direct or indirect
a) Waste and saving by kinds of shades

XVI. *Heating*
1. Hot air
a) Advantages
b) Disadvantages
c) Cost
d) Maintenance
e) Requirements — installations
2. Steam
a) Advantages
b) Disadvantages
c) Kinds (one or two pipe)
d) Cost
e) Maintenance
f) Control
g) Requirements — installation
3. Vapor vacuum
a) Advantages
b) Disadvantages
c) Cost
d) Maintenance
e) Control
4. Hot water
a) Advantages
b) Disadvantages
c) Cost
d) Maintenance
e) Control
f) Valves
g) Tank
h) Automatic forced circulation
5. Fuels and controls
a) Coal
b) Oil
c) Gas
d) Stokers
e) Thermostats
6. Air conditioning

XVII. *Specifications*
1. Sample

XVIII. *The Architects*
1. The fee
2. Services
3. Relation to client

XIX. *Business*
1. Contracts
2. Bond
3. Supervision
4. Payments
5. Permits
6. Insurance
7. Releases

FORM FOR CHECKING PREPARATIONS FOR OPENING SCHOOL IN INDUSTRIAL-ARTS SHOPS

H. L. Stiles, Nogales High School, Nogales, Arizona

Teacher .....
Class observed..... Date.....
Length of visit.....
Points observed:
1. Is there a definite set of projects worked out in advance? ....
2. Are there samples of work on exhibits? ....
3. Is there plenty of material on hand to take care of the needs of the pupils? ....
4. Have the broken tools been repaired or replaced? ....
5. Is all the machinery in good working order? ....
6. Are the lockers and drawers for student projects cleaned and ready for use? ....
7. Are the windows, floors, and desks clean? ....

(Continued on page 320)

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

Pax

On his seventy-second birthday, Frederic William Goudy, the erstwhile bookkeeper who turned to type designing after he was forty years of age, announced a new type face which he named "Pax" dedicating it to world peace. A beautiful thought by the man whose achievements in the field of type designing have earned him a reputation and a world renown that crown him as the modern successor of Gutenberg and Caxton.

World peace, what an ideal to strive for, especially at a time when misguided egotists have already succeeded in involving several nations in a conflict which promises to engulf not only Europe but the whole world into another senseless and useless slaughter.

History relates that a Roman senator, Marcus Porcius Cato, attempted to and finally succeeded in selling his countrymen on the idea that Roman victories over their Carthagenian rivals could only be made final by the complete annihilation of Carthage. He did this by adopting a unique method. Whenever he spoke to the senate, no matter what the subject of his discourse might be, he ended with the exclamation, "Delenda est Carthago!" (Carthage must be destroyed!) His persistence finally won, and Carthage fell.

Probably Goudy, too, hopes that he may sell the world on the idea of peace by presenting to them the type face *pax* to remind all readers that peace, not war, will secure happiness for humanity. Educators may assist him if they but see their opportunity. Like Cato, they can reiterate the value and need of peace, not only for our own country, but for the entire world, until it is accepted by all. Let them prepare youth not to strive that a Carthage be destroyed, but that peace be made enduring for all.

Club Work

It is natural that at the beginning of the new school year a teacher should feel some anxiety about the final outcome of the efforts which he is about to set in motion. It is the mark of a conscientious teacher to have some misgivings whether he is doing all that can be done to achieve the specific objectives of his own subject, and of dovetailing them into the general objectives of education on the school level on which his students happen to be.

Quite frequently a very cursory examination will show him that there are many avenues that he has not as yet explored. Some of these may present many opportunities for interesting guiding and supervising the activities of his students. Extracurricular club work, for instance, has been found to possess great possibilities for affecting the lives of students. Such school clubs have been tried out in many places, and they have shown excellent results at the hands of enthusiastic and willing teachers.

What type of club work is to be recommended? That, of course, depends upon many factors. Probably the personal hobby of the teacher may lend itself readily as a worth-while club activity. If this can be done, the teacher will find that it is easy to influence others to like what appeals strongly to his own personality. But there are exceedingly numerous hobbies from which a teacher can gain vicarious pleasures and experiences, simply by supervising the students engaged in them, and helping them by advice and by showing them how to apply principles of organization that have been acquired either from his own hobby or hobbies, or from his teaching experience.

In this way, many teachers have acquired one or more new hobbies by lending assistance to a few students thoroughly interested in some out-of-school activity. One teacher, for instance, became quite interested in astronomy, simply because a few of his boys asked him to help them make a telescope for studying the stars.

In all of this work, it must not be forgotten that the principle of self-activity, which is so valuable in the classroom, must also find application in this extracurricular work. The students themselves must feel the weight of responsibilities. They must become acquainted with the fact that the things which they wanted most require energy, sacrifice, and perseverance. They must be thoroughly imbued with the idea that it is their club and theirs only as long as they work to retain it.

There are many club activities from which a choice may be made. They encompass the entire gamut of student interest. Anything which gives wholesome exercise to mind or body will be a worth-while activity. If the suggestion for the formation of such a club can be made to come from a group of students themselves, so much the better.

It is perfectly legitimate to ask, what does this type of activity require of the teacher? What does he profit from the energies which he will have to expend? Frankly, the work will not be easy. He must furnish much energy, enthusiasm, and resourcefulness. He will experience much ungratefulness, apathy, and antagonism not only from some of the club members, but also from some of the parents. The people who ought to be most interested in this work, alas, are usually most indifferent.

The school board will undoubtedly become quite interested in this work after its success becomes apparent. They may even be highly edified and impressed, but seldom will their feelings run away with them to the point of raising the salary of the teacher who unselfishly gives of his time and energy to make the work successful.

It is one of these jobs which only the enthusiast will tackle, and out of it will come the enthusiast's reward — the realization that something worth-while has been accomplished, that some students, who might have gone wrong under other circumstances, have been stimulated to prepare themselves to live honorable, useful, and successful lives.

Making the Student Safety-Conscious

Now that the school year 1939–40 has been ushered in, the shop teacher should spend some time carefully checking over his plans for teaching safety during the coming year. Definite safety rules should have a natural and necessary part in instruction wherever power machinery is used. But under no consideration, should safety instruction be overlooked in shops where only hand tools are used.

The students who attend our school shops are being prepared to take their place in life. For most of them, this means

entry into industry in some capacity or other. They must, therefore, be given some understanding of the materials, tools, and processes which they will later meet when engaged in their life's work. This, however, is but one phase of the mental and manual equipment which the student should take along into industry. He should also know how to keep himself and others from harm while working. This means that his school-shop experiences must give him definite safety concepts that he can carry along through life.

To make the study of safety vital, then, should be the aim of every shop teacher. This can be done in many ways. Probably one of the best methods is to set aside three to five minutes each shop period and devote it exclusively to safety. This constant reiteration of the value and need of acquiring safe working habits cannot help but bring results.

The use of the bulletin board for articles on safety, clipped from various sources, is also to be recommended. Safety slogans and bulletins from the National Safety Council also should be used.

Besides all this, do not neglect to guard all the machinery in the best approved manner. Establish safety zones around each machine. Set up definite safety instructions for each power unit. Warn against haste, crowding, and jostling whenever and wherever tools of any kind are issued or used.

Students who are trained in this manner will become safe workers who can be depended upon to do their full duty to society, not only protecting themselves against dangers, but safeguarding others as well.

The Right Start

The beginning of the school year is the right time to put into execution those changes which were found necessary last year as the course outline was being followed in the regular process of teaching. Unfortunately many of these necessary changes were recorded mentally only and they have been forgotten long ago. But, it is to be hoped, that at least some of the changes were noted in writing. Have steps been taken to incorporate them in the work this year? If not, right now is the time to take care of that necessity, for if the work in the school shop is to become progressively better, the school year 1939–40 must be an improvement over last year, and this can most readily be done by inaugurating promptly those modifications which were found necessary last year.

But what about those changes that were not registered and are now forgotten? Well, they are sure to bob up again during the coming year. Make a note of them. A special notebook should be provided for these memorandums, then the dilemma which confronts so many shop instructors right now will not again trouble them in the future.

The Special Fire Hazard

Because of the special difficulties presented in maintaining a shop which is free of fire hazards, it falls to the lot of the teachers of industrial-arts and vocational-education subjects to take special and extraordinary precautions to protect the lives of their students, and to insure the safety of their schools against the dangers of fire.

For this reason, it may be well to follow the suggestions made by the Newark Safety Council, which may be summarized in a special way for the shop teacher:

Have special drills for the shop students, inserting obstacle problems. Make this a regular part of the shop routine.

Make sure that in the event of fire the shop will be emptied quickly and that the fire alarm for the entire school be given.

Provide effective means of fighting fire at its source, so as to extinguish it quickly or keep it under control.

Know how to use the fire extinguishers provided. Do not wait to acquaint yourself with the proper method of handling them until a fire demands their immediate use. Instruct some of the more dependable students how to operate them.

Keep the amount of inflammable liquids in the school shop down to a minimum and see that they are stored in fire-resistive lockers or cabinets.

See that oil and paint-soaked rags and waste are kept in safety cans during the day, and that they are promptly removed to safe storage or disposed of at the end of every school day.

If possible, have a sprinkler system installed in the shop, finishing room, and storage room.

Organize a fire brigade among the students, but train them to obey implicitly so that they can be promptly withdrawn when the regular fire fighters take over.

Make the students conscious of the ever-present danger of fires, and be especially careful in maintaining a strict taboo on all smoking in the school shop.

The Special Task for 1939-40

What particular piece of work can the shop teacher set up for himself for the coming school year? Is it necessary that he look about for such work, since the classes will occupy so much of his time and energy?

While the teacher's job draws heavily on him, yet if he wants to progress, he must continually be on the alert to improve himself and the work he is offering.

That the instructional material be brought up to date, that certain parts of it be amplified, that errors in it be corrected — all this is self-evident. But it is well to do something beyond this, and the wide-awake teacher will find many occasions for extending his influence, since the classroom presents so many opportunities for making searching studies on smaller or larger groups.

Many teachers, for instance, have their students carefully note the time of starting and finishing a job. In a goodly number of cases, the student is even required to figure out the elapsed time. Yet little use is made of this continually growing mass of factual data.

A little systematic study of these records would enable the teacher to establish a standard time for each one of his projects and consequently, he would be able to work out a grading scheme that would be much more efficient than those commonly employed.

Leisure-time habits of students also may form the basis for many short studies and show how the school may be dovetailed into the home life of the individual.

Other studies could be made, to discover the effect and the value of the school shop in the lives of the students of former years; the reading habits of the students who attend the school shop; the equipment, tools, and home-shop facilities that are accessible to the boys in their homes; and where they obtain the materials required for their out-of-school projects.

Would it not be well to make at least one of these studies per year, and to start the first one right now?

(Continued from page 317)

8. Does the teacher have a definite set of objectives for each course worked out? ....
9. Does the teacher have an outline of the work he expects to cover during the year worked out for each course? ....
10. Have the pictures, wall charts, and wall exhibits been changed or rearranged since the last semester? ....
11. Has the teacher worked out any new projects for the coming year? ....
12. Does the teacher have an outline of the demonstrations he wishes to use? ....
13. Are the textbooks and reference books on hand for the opening day? ....
14. Does the instructor have a sufficient supply of instruction sheets, job sheets, and information sheets on hand? ....
15. Does the instructor have definite plans for each class on the opening day? ....

Special notes: .....

Vocabulary Study of Machine-Shop Texts

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A summary of a vocabulary study made in the author's ninth- and tenth-grade classes.

The inability of pupils to comprehend the subject matter in their textbooks presents a major problem in their schoolwork. Reading material must be fitted to the pupil's reading ability. Many vocabulary studies have been made of school literature but few deal with the technical vocabularies of the special subjects. A survey of the literature, especially in the fields of industrial arts and vocational education, reveals the fact that nothing has been written on the comprehension vocabulary of machine-shop texts.

The problem in this study was to discover in four typical machine-shop texts some of the words, the meanings of which are not understood by forty, ninth- and tenth-grade pupils in the writer's machine-shop classes.

Pressey's[1] compilation of a technical vocabulary for manual training is more closely related to the study reported here than any other in vocational education. It is, however, concerned only with woodwork and elementary metalwork and thus does not deal adequately with the vocabulary of machine shop or of machine-shop texts.

Subjects Used in This Experiment

The writer feels that the pupils used in this investigation were typical of those in Grades IX and X who take the machine-shop courses. Moreover, the ninth- and tenth-grade pupils in these classes represent a cross section of the pupils in these grades. They come principally to the junior trade school from parochial schools, intermediate schools, and high schools. Two of the pupils, however, had come from rural schools.

These pupils come mostly from the poorer and middle-class homes in which foreign languages are spoken to a great extent. All except four pupils were American born. Nationalities represented by the eighty parents are: Polish 20, Italian 10, German 9, American 6, Slavish 4, Russian 4, Irish 3, English 3, American (colored) 2, French 2, Belgian 2, Dutch 2, Lithuanian 2, Hungarian 1, and Danish 1.

The occupations of the fathers of the subjects are: laborer 9, auto assembler 2, machinist 2, bricklayer 2, carpenter 2, tinsmith 1, night watchman 1, gate watchman 1, solderer 1, fireman on boat 1, auto electrician 1, real estate salesman 1, sheet-metal-work foreman 1, steamfitter 1, furnace tender 1, punch-press operator 1, master plumber 1, truck driver 1, saloon keeper 1, grocery keeper 1, blacksmith 1, lathe hand 1, toolmaker 1, real estate and builder 1, molding foreman 1, sweeper 1, "never saw him" 2.

The amount of machine-shop experience the individual pupils possessed at the time of testing varied from eighteen hours to as much as two years. This amount of machine-shop practice included also that which some of the pupils had in other schools, before coming to the junior trade school.

The mean age of the subjects was 16.3 years. Six pupils were 15 years old, 20 pupils were 16 years old, 10 pupils were 17 years old, 2 pupils were 18 years old, and 2 pupils were 19 years old.

Selection of the Four Texts Used as Source Material in This Study

An important problem was that of selecting typical ninth- and tenth-grade machine-shop texts. The texts chosen had to be those which are extensively used in machine-shop practice. Books which are found in the school machine shops are, as a rule, used mainly for references and not for texts. There is no text, specifically, for the ninth grade or for the tenth grade in machine-shop practice.

To meet the problem of selecting the texts to be used in this study twelve machine-shop teachers in schools in Detroit and near-by cities and one machine-shop supervisor in Detroit were asked to name four texts which in their opinions were most suitable for ninth- and tenth-grade machine-shop instruction. The four texts were selected which were most frequently mentioned by these experts.

For the sake of brevity the texts used in this study will be referred to as Text I, Text II, Text III, and Text IV.

Method of Determining Uncomprehended Words

Each pupil marked 19 pages in Text I, 7 pages in Text II, and 10 pages in Text III. In addition to this the first thirty pupils marked 4 pages each and the last ten pupils marked 3 pages each in Text IV. No two pupils were assigned the same portion in any of the four texts.

From the findings in the preliminary experiments and the findings of other investigators, the technique of having pupils underline the words not comprehended by them possesses considerable reliability. Throughout the examination the writer was the examiner. It is highly important, with this technique, that each pupil should work in a free and unforced manner and as nearly up to his natural, or ordinary, capacity as possible. In having the pupils do the marking it was pointed out that this marking had nothing whatever to do with their marks in school and that the main requirement was honesty. Each pupil was given as much time as he required to complete his portion of the marking. The vocabularies of these four texts were checked by the forty pupils by means of underlining the words of which they thought they did not know the meanings. Thus a list of words, uncomprehended by the pupils, was obtained.

Method of Word Tabulation

The writer personally checked and tabulated the words in this study. In tabulating the words a record was made of the part of speech of each word as it appeared in the context; the parts of speech were then rechecked by an English teacher in the University High School, Ann Arbor, Mich. All compound and proper nouns were listed as nouns; all passive infinitives were listed as infinitives. Every difference in spelling was counted

[1] Pressey, Luella Cole, "The Determination of the Technical Vocabulary of the School Subjects," *School and Society*, Vol. XX (July 19, 1924), pp. 91–96.

as a new word, except that plural nouns formed by adding *s* to the singular were counted with the singular form. Abbreviations, numerals, and letters used in formulas were omitted from the tabulation.

Determining Which Words Are Technical and Which Are Nontechnical

The task of determining which words are technical and which are nontechnical is not an easy one. Because no two persons would probably agree, any decision must be arbitrary and subjective in character.

In selecting a criterion for determining which words are technical and which are nontechnical, Pressey's[2] manual-training list of technical words was considered. This list, however, is mainly concerned with woodwork and elementary metalwork; thus it does not serve adequately as a criterion in this investigation of machine-shop texts. Subsequently, Crispin's *Dictionary of Technical Terms* was used as the criterion. All words contained in the *Dictionary of Technical Terms* are italicized in this list as *abrasion, abrasive,* and *accurate*. Crispin's *Dictionary of Technical Terms,* however, does not contain all forms of a word. For example, it contains the word *accurate,* but it does not contain the words *accuracy* and *accurately*. Thus the following rule was adhered to: If the *Dictionary of Technical Terms* contained one form of the word the other forms of the same word were also tabulated in this list as if they were in the *Dictionary of Technical Terms.*

This list also contains numerous words which are technical but which are not in the *Dictionary of Technical Terms;* there are also a number of technical words, such as, BED, CAPACITY, and COLUMN, for which the *Dictionary of Technical Terms* gives definitions which are entirely foreign to the words as given in the texts. All these words the writer has, after delving into their uses and meanings as they appear in the context, arbitrarily tabulated as technical. They are the capitalized words in the list as ABUTTING, ACME, ACUTE, ACUTE BEVEL, and ADJACENT. Thus all technical words are either italicized or capitalized.

[2]Pressey, L. C., *The Technical Vocabularies of the Public School Subjects* (Section 13: Manual Training), p. 7. (Bloomington, Ill.: Public School Publishing Company.)

The Commonness of These Words

To determine how common are the words resulting in this study they have been checked with Thorndike's[3] 10,000 most frequently used words. Attention is called to the fact that although numerous words in this list are also listed in *The Teacher's Word Book,* it is doubtful if the same meanings are attached to these same words in the two lists. For example, the word *rake* as in this list refers to a certain kind of clearance on a cutting tool, while the same word *rake* may have entirely different meanings in *The Teacher's Word Book*. It is also questionable if the words in *The Teacher's Word Book* are the same parts of speech as in this list since the parts of speech are not tabulated in *The Teacher's Word Book*. In checking this list with *The Teacher's Word Book* the method of word tabulation used by Thorndike must necessarily be applied.

The Word List

The words resulting from this investigation were tabulated in the order of decreasing frequency as underlined by the forty, ninth- and tenth-grade pupils who came in contact with the word and underlined it as uncomprehended. Particular attention is called to the fact that not all of the forty pupils came in contact with every word in the list as each pupil reviewed only a small portion of each text; that no two pupils were assigned the same portion in any of the four texts.

The words, 1,739 in number, were listed for each text as well as the total for all the texts. The tabulation revealed that a total of 892 words were underlined as uncomprehended in Text I; a total of 472 words were underlined as uncomprehended in Text II; a total of 582 words were underlined as uncomprehended in Text III; and a total of 220 words were underlined as uncomprehended in Text IV. Eleven of the 1,739 words were common to all the texts, 77 were common to three of the texts, and 240 were common to two of the texts; this seems to indicate that the four texts have very unlike vocabularies.

[3]Thorndike, Edward L., *The Teacher's Word Book* (New York: Teachers College, Columbia University, 1921), p. 134.

The words found in Crispin's *Dictionary of Technical Terms,* which was used as the criterion for determining the technical and nontechnical words are italicized in the word list. There are 1,617 technical words in the entire list; 727 of these technical words are given in the *Dictionary of Technical Terms*. The nontechnical words number only 122; this indicates that few nontechnical words were uncomprehended by the pupils.

The part of speech of each word as it appeared in the context was recorded; the purpose of this was to aid in the further study and teaching of the meanings of these words in the classroom.

The frequencies of the words as given in Thorndike's *The Teacher's Word Book* were also listed. It was found that of the 1,739 words, 1,120 are not tabulated in *The Teacher's Word Book;* that of the 619 words listed in *The Teacher's Word Book,* 264 words were in the 5,145 to 10,000 group. This reveals the fact that most of the words are not among the 10,000 most commonly used words. Ninety-one of the 122 nontechnical words, which were uncomprehended by the pupils, are tabulated in *The Teacher's Word Book*.

The words were also tabulated in alphabetical order for ready reference.

Summary and Conclusions

The conclusions stated here merely express the findings of this investigation. Similar investigation, made elsewhere, might reveal somewhat different results. Two conclusions of this study are:

1. Ninety-three per cent of the words underlined in the four texts are technical.
2. Sixty-four per cent of the words in this list are not tabulated in Thorndike's *The Teacher's Word Book*.

Implications

1. The list emphasizes the words which are apt to be stumbling blocks in the comprehension of the subject matter in machine-shop texts.
2. The list may be a basis for further study and for vocabulary tests in machine-shop practice and the closely allied subjects.

Course of Study in Industrial-Arts Cabinetmaking — III

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This is the third part of the outline of study.

List of Projects

Bench Tools: Cutting board, mounting board, bench hook, sandpaper blocks.

For Beginners: Plant stand, doorstops, lamps, birdhouses, glove box.

Butt Joint: Book racks, toolbox, knife, fork and spoon box, flower box, shoeshine box, ornamental boxes.

Curved Surfaces: Wall shelves, magazine racks, sewing cabinets, newspaper rack, book racks and end tables, smoking stand.

Glued Joints: Ironing board, bread board, drawing board, taborets, table tops,

end tables, tilt-top tables, smoking stands, bench tops, magazine basket.

Dowel Joint: Smoking stands, benches, umbrella stands, footstools, any other suitable project.

Half-Lap Joint: Taboret, plant stand, costumes, pedestals, tables, Christmas-tree standards, smoking stands.

Mortise-and-Tenon Joint: Piano bench, tables, radio cabinets, end tables, telephone chair, occasional tables, magazine racks, smoking stands, desks.

Miter Joint: Picture frames, sewing trays, moldings, utility bench, any other suitable job.

Rabbeting and Routing: Medicine cabinet, bracket shelves, wall newspaper rack, sewing tray, picture frames, bookcase.

Machine-Work Lathe (Wood Turning): Tenpins, Indian clubs, dumbbells, potato masher, lamps, candlesticks, croquet set.

Furniture Projects: Band saw, circular saw, jointer.

Group Projects: Breakfast set, doghouse, rabbit hutch, house in section.

Outside Preparation — Cabinetmaking

1. To make a small plant trellis for indoor use, shade pulls, doorstops, garden markers, etc.

(Article to be made should be of simple design and construction, and should aid the pupil in learning the proper uses of some of the more common tools.)

2. To upholster a chair seat or stool.

Ask the pupils who care to attack the problem to bring in small chairs or stools or make them. If they must be made it will probably be best to restrict the design to miniature sizes because of the time required to make larger ones.

3. To make racks for clothes, shoes, magazines, etc.

4. To mix, thin, and apply lacquer.
   - *a*) Thinner.
   - *b*) Care in brushing.

5. To mix, thin, and apply paint, enamel and varnish.
   - *a*) To thin.
   - *b*) Prepare surface for work.
   - *c*) To apply paint or varnish.
   - *d*) To rub down, etc.
   - *e*) Apply paste and liquid fillers.
   - *f*) To use wax and furniture polish.

6. To mix, thin, and apply calcimine, shellac, and stains.

7. To clean and care for paint brushes.

8. To repair toys and furniture.
   - *a*) Prepare a pot of glue.
   - *b*) Use liquid glue properly.
   - *c*) Use makeshift clamps.
   - *d*) To fit table and dresser drawers.

9. To build and put up a bracket shelf (to hang a mirror or picture upon the wall that has no picture molding).
   - *a*) How to locate studs.
   - *b*) How to drive cut nails in a brick wall or how to drill for plugs.
   - *c*) How to patch a hole in a plastered wall.

10. To remove old paint and varnish, to refinish old furniture, etc.

11. To replace a pane of glass.
   - *a*) To loosen a window.
   - *b*) To remove a double-hung sash from frame.
   - *c*) To replace window chains and cords.
   - *d*) To replace a sash lock.
   - *e*) To replace a glass in a tray, mirror or picture frame.
   - *f*) To remove old putty.

12. To fit and repair simple locks and hinges.
   - *a*) To replace a broken spring.
   - *b*) To adjust a lock strike.
   - *c*) To set small mortise hinges.
   - *d*) To put on strap hinges.
   - *e*) To set drawer pulls and locks.
   - *f*) To attach a door latch, cupboard catch, etc.
   - *g*) To put on common and chain bolts.

13. To make a small project like a book end, tabaret, or the like.
   - *a*) To square stock — find and use working edge, etc.
   - *b*) To read a rule to sixteenths.
   - *c*) To sharpen edged tools.
   - *d*) To assemble and adjust a plane.
   - *e*) To fasten wood together with flat, oval, and roundhead screws.
   - *f*) To put screws into hardwood.
   - *g*) To glue a joint.
   - *h*) To file and set a saw.

14. To fasten curtain rods and fixtures.
   - *a*) To wind up a shade.

15. To make a mitered joint for picture frame, etc.

16. To make and fit screens.
   - *a*) To hang a screen door.
   - *b*) To adjust a sagging door.
   - *c*) To cut and fit weather strips.

Pupils should be carefully checked to see that each has had an opportunity to master most of the items outlined. Some pupils may be able to make several personal projects in addition but care should be taken to be sure that all such persons have obtained what they need from the whole course before being allowed to proceed too far with other personal problems.

17. To put a mantle on a gas lamp and operate the lamp successfully.

18. To clean a refrigerator.

19. To examine faucets and put them in order.

20. To understand the construction of a faucet.

21. To clean a trap.

22. To open a drain pipe which has become stopped; to repair a flush tank.

23. To clean and put a carpet sweeper in good working order.

24. To sharpen a kitchen knife made of steel.

25. To remove or replace a door with loose pin butt hinges.

26. To tighten a belt on a sewing machine.

27. To clean and oil a sewing machine.

28. Targets.

29. Drill bullets from rifle.

30. Clean rod.

31. Minnow pail.

32. Bait box.

33. Live bait can.

34. Tackle box.

35. Patching rubber boots.

36. Overhaul and repair bicycle.

37. Camp chair.

38. Water pail.

39. Cups.

40. Pans.

41. Boat keels.

42. Candlesticks.

43. Toys.

44. Radio club.

45. Crystal receivers.

46. Tube receivers.

47. Short-wave transmitters.

48. Short-wave receivers.

49. Erect antenna.

50. Install ground wire.

51. Protect set from lightning.

52. Motors.

53. Generators.

54. Coils.

55. Condensers.

56. Repair electrical devices.

57. Replace fuses.

58. Battery charger.

59. Electrical toys.

60. Built rowboat or sailboat.

61. Boat repairs.

62. Boat painting.

63. Repair tires.

64. Clean spark plugs.

65. Clean battery terminals.

66. Clean carbon.

67. Grind valves.

68. Remove dents.

69. Clean gas line.

70. Protect car from freezing.

71. Prepare car for storage.

72. Oil car.

73. Change oil.

74. Replace fuses.

75. Construct jumping standard.

76. Basketball goals.

77. Airplanes.

78. Steam turbines.

79. Water turbines.

80. Retemper and reshape tools.

81. Sharpen tools.

82. Thaw out frozen pipes.

83. Construct and equip a home workshop.

General Projects

84. Ash tray.

85. Book ends.

86. Blotter-pad corners.

87. Fireplace set.

88. Fernery.

89. Screw driver.

90. Paper weight.

91. Sled.

92. Scoop.

93. Lighting fixtures.

94. Watch fob.

95. Umbrella rack.

96. Bench.

97. Flower box.

98. Garden seat.

99. Garden trellis.

100. Garden arch.

101. Linoleum block prints.

102. Print handbills.

103. Make Christmas cards.

104. Repair old books.

Silk-Screen Stencil Printing

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An interesting process which may make a valuable addition to present industrial-arts and vocational courses.

Progressive vocational-school leaders all over the country are constantly on the lookout for new subjects with which to replace those outmoded which retain their status on the curriculum merely by virtue of tradition. Silk-screen process printing may be considered as one such new subject. It is the purpose of this article to briefly describe the process, and to show its uses and applicability as a subject for vocational schools.

Briefly described, silk-screen stencil printing is a process in which the stencil bearing the design to be reproduced, is permanently affixed to a screen consisting of silk or organdy. Paint, or any other printing medium, is forced through the stencil by means of a rubber blade or squeegee, and is deposited on the printing surface. This method of reproduction is, among other things, very speedy — at least 300 facsimiles can be made in one hour. It has the added advantage of hairline registration; not having to cope with the distress of the trial-and-error element present in linoleum and wood-block printing.

To be sure there are many other new and meritorious subjects which might be included in a revised curriculum, but which, because of meager appropriations, inherent limitations, and other inadequacies, cannot be introduced into the schools. The silk-screen process, on the other hand, because of the simple nature of its apparatus, can readily be included in the school system without incurring much initial expense, or causing high maintenance costs.

A complete silk-screen stencil unit, which includes a stencil frame large enough to print surfaces up to about 14 by 22 in., a squeegee for forcing the paint through the screen, and a few elementary colors, can be set up at an outlay of not more than $2. For printing on larger areas, naturally a larger stencil is needed. Let us see what changes in cost that would incur.

The stencil is nothing more complicated than a frame made of furring strip or other lumber. When anticipating a run of less than 50,000 prints, as in the schools, the frame is covered with a screen of organdy which sells at 70 cents a yard. Where runs of over 50,000 prints are required, as in commercial shops; a special silk commonly known as domestic bolting cloth, sold in 40-inch widths at a cost of $2.50 a yard, should be used for the screen. It is important to note that the completion of one design does not mark the end of the usefulness of the silk. When one design is finished, the screen can be washed, and another design may be printed — using the same screen.

The equipment necessary for silk-screen printing is very simple. The printing frame may be attached to any flat, even surface such as a drawing board, heavy panel board, or table top. The squeegee may be

Types of silk-screen ornamentations

bought ready made in any specified length, or it may be constructed in the school. A squeegee consists of a piece of substantial rubber belting, sandwiched between two pieces of wood; the rubber blade protruding about 1¼ in. The wood on either side of the rubber serves the double purpose of strengthening the squeegee, and providing a gripping edge for use in manipulating it across the screen.

Silk screen is essentially a printing process for reproducing designs in one or many colors. Whereas other methods are limited to one or just a few surfaces, in silk-screen printing, the same stencil and equipment are used for printing on a variety of surfaces and materials, among which may be listed: paper, cardboard, wood, cork, metal, glass, linoleum, felt, cloth, leather, mirror, and a host of others. This process is flexible not only in its choice of surfaces, but also in its variety of printing mediums. Adjusting the medium to the suitability and utility, the silk-screen printer may choose from both brilliant and pastel shades of inks, paints, waterproof japan colors, fast dyes, opaque colors, transparent colors, water colors, etching compounds, or even glue and varnish. Compared with related graphic-art processes and methods, silk screen is surely the most flexible in the respect of color opacity. It is just as easy to print white on black as it is to print black on white, and yet retain the color values.

In addition to the simplicity of equipment, and directly related to its applicability as a school subject, silk screen has the advantage of simplicity of operation. It is not a hazardous activity. The process is a hand-operated one, and does not require the same safety precautions which other methods entail. It is not a power-driven process, it does not employ heavy machinery, and has no cutting edges. Since it does not involve dangerous manipulation, and does not endanger young and unskilled hands, school administrators are not hesitant about introducing silk screen as a subject.

Silk screen also offers a splendid opportunity for the co-ordination and correlation of various school subjects, such as shop-work, art work, textile work, lettering, and the general graphic arts.

The work of the shop class clearly lies in the field of frame and squeegee construction. The textile and art groups may work together or competitively for creating the original design to be reproduced. The making of the stencil and the running of the job can become the specialty of the process class. The process may then be used for printing repeat motifs on drapes, curtains, dress material, scarves, aprons, handkerchiefs, and the like, for the students. It may also be used for decorating shop projects, greeting and Christmas cards, rugs and lamp shades, and posters and signs.

The silk-screen process has universal appeal and usefulness for the entire school. Publicity posters for entertainments, sports events, dances, and the like, may be made rapidly and inexpensively with it. The process has also been used to great advantage in producing school magazine covers, school pennants, and all sorts of school announcements. Without a doubt, silk-screen printing is an asset to the publicity phase of school life.

If silk-screen printing were adaptable only as an art, craft, or hobby, it would not be sensible to praise and urge its further extension in the curriculum for vocational and industrial schools. It would not do at all to teach a subject merely because it makes use of simple and cheap equipment, because it can boast of simplicity of operation, because it is safe and flexible, or because it may be used co-ordinately with other industrial-art subjects. But when a subject can truly boast of all of these aforementioned virtues, and in addition to this, can offer a real training in a growing industry, then it deserves a place in the vocational-school system.

Silk screen is rapidly becoming an industry employing thousands of artisans and craftsmen. National advertisers here and abroad, are taking advantage of this process, and using it for quantity production of displays, car cards, window cards, billboards, signs, etc.

The supply of skilled craftsmen, however, has not kept pace with the demand for trained workers in the field. It should be the aim and duty of the progressive vocational schools to supply that growing demand.

Methods of Type Composition

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Students in the average school shop — be it junior, senior, vocational high or trade school — are not always in a position to know type composition other than setting type by hand. Many of these students, upon graduation, find themselves at a loss in large plants having machine-composition facilities.

It is true, most believe, that hand composition is a basic fundamental for machine composition and newspaper and commercial assembly. Facilities in most school shops militate against a complete course in machine composition. Yet there is little doubt that these students should have at least a conversant knowledge of the subject of all types of machine composition. If such equipment is not available for their use, then this instruction becomes the "related" type, and must be carried on in a classroom, aided by planned trips to local printing plants doing this type of work.

The printing teacher, in this case, can use the following material suggested as an outline as a basis for this type of instruction.

Hand-Set Type

Hand-set types are assembled from two kinds of materials: foundry type and monotype. Long "takes" of small sizes (5 to 18 point) are usually not set by hand. In the case of short "takes," however, small sizes are set by hand when the adjusting of the Monotype keyboard and caster, or a slug-casting machine requires a longer period of time than setting the matter by hand.

Distribution. Foundry type is so made that it can be distributed back into the cases and used again and again. Single types, monotype made, and placed in cases for setting by hand is used once, and thrown into the metal pot when a job is dead. It is claimed that monotype material is made so cheaply that it does not pay to hire a man to distribute it. There seems to be no set rule for distribution of monotype materials. In some composing rooms the larger sizes are used again — in other plants the entire forms are fed to the pot after one printing.

An excellent related materials lesson for the print shop.

Advantages of hand-set type include:

1. Unlimited flexibility. Nearly all sizes of a series are available in foundry type at a fraction of the cost of matrices and their receptacles. Caslon is made in at least 15 series; Cheltenham is found in 23 different widths, weights, and styles. Therefore many occasional faces are set by hand. Considerable borders, initials, and decorative material is designed for type faces in families.

2. Exact spacing may be done between characters and words. This spacing will *look* even in certain word combinations, when spaced with different widths between each word. For example, a larger space (en or two 3 ems) between one word ending in *f* and one beginning with *h*; a medium space (3 em) between one word ending in *e* and one beginning with *s*; a thin space (4 em or 5 em) between words ending in *y* and another beginning with *w*.

3. Letterspacing of words in caps is done with ease in hand composition.

4. An accuracy of 1/10,000 of an inch is maintained in good foundry type made by reputable firms.

5. The printing surfaces of foundry type is free from sinks and pinholes — it is considered by many to be the best printing surface available.

6. There is less make-ready on presses with *new* foundry type, because all printing surfaces are .918 high.

7. A whole series of foundry type can be purchased at little cost by the small printer whose work does not require an investment of thousands of dollars for composing machines. To make money on composing machines, they must be operated most of the working week. Investment in an expensive machine to be operated two days a week is not compatible with making a profit, and therefore should not be considered.

8. Time consumed in setting type by hand depends upon the skill of the compositor. Standards, however, regard the preparation time to be about .1 of an hour, and lines up to 22 picas wide, .05 of an hour; 23 to 30 picas wide, .1 of an hour, and over 30 picas wide, .15 of an hour.

Keyboard Line-Casting Machines

Keyboard line-casting machines are the Linotype, Intertype, and Linograph. All are similar as to principle, in the circulating matrix — all are different in some respects as to the mechanism which controls this circulation.

In the past, these machines were limited to the casting of "straight" matter composition of small sizes, now slug lines are cast up to 36 points in a practical manner. Sizes up to 60-point condensed faces are possible.

Advantages in keyboard line-casting machines, other than the fact that this matter need not be distributed, include:

1. Great speed of composition from copy to slug lines, all ready on a galley.

2. Speed of assembly into pages and columns with a minimum danger of pied lines, which is particularly advantageous in newspaper work.

3. Extraordinary speed of composition of quadded lines — centered, flush left or flush right. Savings in composition time of 80 per cent are possible on machines equipped with a "self-quadder."

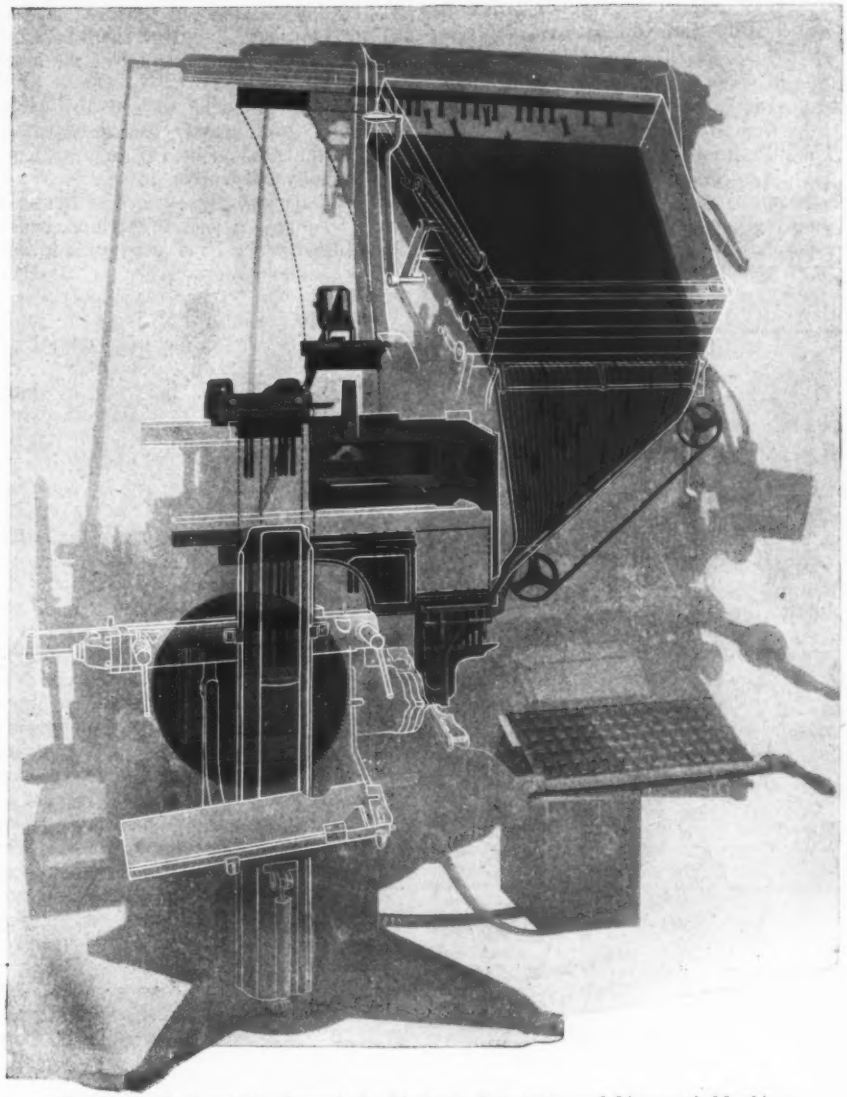
4. Ease of keyboard operation and of general maintenance.

5. Border and rule may be cast in 30- to 42-pica lengths.

6. Recasting, for printing jobs in gangs, is possible at speeds of from 6 to 7 lines per minute.

Measures over 30 picas necessitate the "butted-slug" type of composition on most machines, which cuts production time. Some machines may be equipped with 42-pica molds, however.

Time consumed in casting 1,000 ems of a particular size of type, and not counting the setting up of the machine, figures roughly about .23 hours for 6 point, .39 hours for 8 point, .37 hours for 10 point, and .42 hours for 12 point.



Showing path of matrics through the Linotype, Intertype, and Linograph Machines

Intertype machines can be classified as follows:

1. Single distributor types (non-mixers) in

a) Four models: 1, 2, 3, and 4 magazines of 90 channels, with

b) 1, 2, 3, or 4 side magazines.

c) A, B, C3, and C4. "C4" is a model C with 4 main magazines.

d) "Sm" means side magazines.

e) H, with 1, 2, 3, or 4 main 72-channel magazines with 1 to 4 side magazines.

2. Mixers. (Allowing mixed composition from two magazines.)

a) F, with 2 or 4 90-channel magazines.

b) G, with 2 or 4 magazines of 90 channels, allowing mixing from any two adjacent magazines.

3. Standardization — all C models are standardized, and all others over serial number 1156 are standardized.

4. Magazines are all interchangeable, except between 72- and 90-channel types.

Linotype machines can be classified as follows, considering the machines in most general use today:

1. Model 5 — single magazine.

2. Model 8 — 3 magazines.

3. Model 14 — 3 main magazines and one side magazine.

4. Model 30 — 4 main magazines, with 1 to 4 side magazines.

5. Model 31 — 4 main magazines, with 72 and/or 90 channels.

6. Model 32 — 4 main magazines, with 72 and/or 90 channels, single distributor, with 1 to 4 magazines with 34 channels.

Linograph machines can be classified as follows:

1. Old models with 1 to 3 magazines, using short, nonstandard matrices.

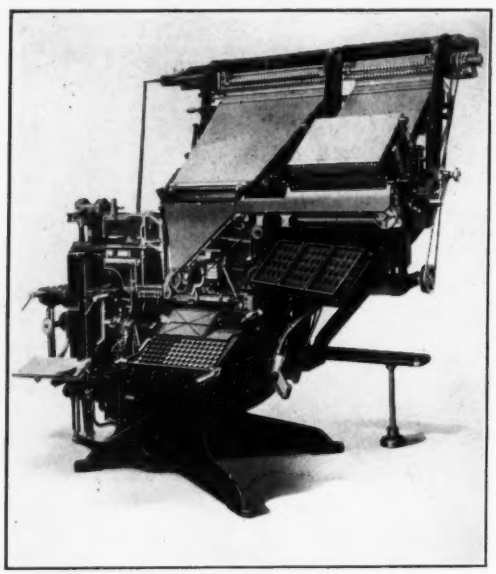
2. Model 50, using standard matrices, casting from 5 to 24 point. Faces can be used up to a 297-point lower-case alphabet. Vertical magazines, 17 matrices in each channel, with a two-in-one distributor.

The Teletypesetter

The Teletypesetter is a keyboard line-casting machine attachment for controlling Linotype or Intertype machines by means of a perforated ribbon, or tape.

The "Perforator" machine is operated like a typewriter to prepare the tape at speeds up to seven lines a minute. The "Operating" unit, attached to the machine, is controlled by the perforated tape.

At present being a newspaper composing machine, the perforated tape may be

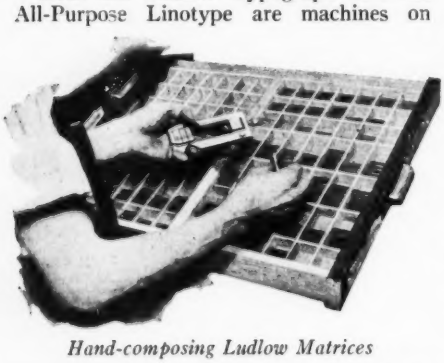


Model 30 Linotype

passed through printing telegraph transmitters to send in code to distant points where duplicate tapes may be prepared on teletype perforators by regular stenographers for use on line-casting machines. Measure up to 30 picas, in sizes of type from 5½ to 12 point may be set, and full use of the two-letter matrices may be had.

Ludlow Typograph and All-Purpose Linotype

Both the Ludlow Typograph and the All-Purpose Linotype are machines on



Hand-composing Ludlow Matrices

which hand-set matrices are cast in lines. Each is especially adapted to casting large slug lines in various measures, up to full-size newspaper widths, usually 99½ picas, in butted slugs. It is not practical to cast 42- to 144-point lines on the keyboard line-casting machines, because of the large size of the matrices.

It is not practical to set any great amount of type matter smaller than 18 point on these machines. On each machine, it is usually preferable to "surface" or "burnish" the printing surface of the sizes above 30 point. A special machine, called the "Supersurfacer," is used in addition to the Ludlow. A surfacer is attached directly on the All-Purpose Linotype for this work.

Ludlow Typograph's special advantages are as follows:

1. Sizes of type are available from 6 to 72 point, and larger sizes are cast lengthwise on the slug up to 144 and 220 point.

2. The machine is equipped with either 21- or 22½-pica molds. On lines longer than this, the proper length of stick is selected, the line is justified, and the stick is fed into a machine, and the long line is cast on a series of 22½-pica slugs. Uneven multiples of 22½ picas are sawed off. Machines are equipped with interchangeable 6- and 12-point molds. Sizes smaller than 12 point are cast on the 6-point mold; all sizes larger than 12 point are cast on the 12-point mold. Because of the overhanging of the large letters, like a letter T, this is no handicap. The overhanging sections are built up with slugs made on the machine, or on the Elrod material maker.

3. Blank-rule form casting is excellent when produced on the Ludlow. Each line is locked with the one preceding it, forming a very close-fitting piece of composition, which rivals a wax engraving.

4. Recasting is possible at 6 lines per minute.

5. Manufacturers claim a greater speed in setting the matrices and distributing them, as compared with regular hand-type composition. The operator picks up four or five matrices successively between his fingers and places them in his stick. Distribution is done in the same quick manner. Hairline justification is not necessary, as in regular type composition.

6. Italic faces are cast with unbreakable kerns.

7. Special sticks are available which self-quad and center a line of matrices automatically.

8. Time consumed figures less than that of hand composition of regular type from cases, in general. This does not include, of course, recast lines.

9. With an adequate supply of Ludlow matrices, one does not "run out of type" at any time. Also, there is a decided advantage in the fact that all of this type is *new* for each job.

The All-Purpose Linotype has the following advantages:

1. All sizes of molds are available up to 72 point. Four molds are placed on the mold disk of the machine. The mold length is 42 picas, which takes care of the majority of work in both newspaper and job printing plants. Lines are quickly cast from hand-set matrices, assembled similarly to those of the Ludlow, on any slug size, either overhanging or on a larger slug than the body of the type. For example, a 144-point character can be cast on a 36-point slug, or a 12-point character on a 144-point slug.

2. Because of the large molds available, furniture and base material can be cast up to 6 picas in width to 42 picas in length.

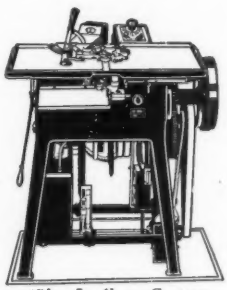
3. A self-tripping device is standard equipment, allowing the machine to cast type lines or furniture with little attention from the operator, and at varying speeds to suit the size of the material cast.

4. Slugs are cooled by water as they fall into a galley, making them ready for immediate handling.

5. Italic faces have nonbreakable kerns.

6. Matrices from other machines can be cast, with the addition of a special composing stick.

7. Sizes up to 144 point can be cast lengthwise, in the regular way, on the slug.



The Ludlow Caster

8. Borders and rule may be cast.

9. The burnisher or face surfacer is built into the machine, saving extra handling, as the line is surfaced before it is ejected from the machine.

10. The alignment of characters on a slug can be controlled with the use of a handwheel.

11. Individual types, 96 to 144 point, can be cast, cut apart on a special saw attached to the machine, and placed in cases for hand composition.

12. The composition of the matrices is done with the casting side up.

13. The time consumed in this work, not counting recast lines, is less than regular hand composition. Again we have the advantages of sufficient "sorts," and new type for each job.

The Monotype Machines

The various machines in the monotype system do the following work: casts single types from type metal and sets them in justified lines; casts single types to be placed in type cases to be set by hand; and casts leads, slugs, borders, quads, and spaces.

The Type-and-Rule Caster is useful for the following:

1. Casts single types from 4 to 36 point, with quads and spaces, to be laid in cases and set by hand.
2. Decorative matrices for borders may be cast.
3. With special attachment, rules from 2 to 12 point, and leads and slugs from 1½ to 12 point may be cast.

The Giant Caster makes the following material:

1. Casts single types from 14 to 72 point, and 84-point title faces, with quads and spaces, to be laid in cases and set by hand.

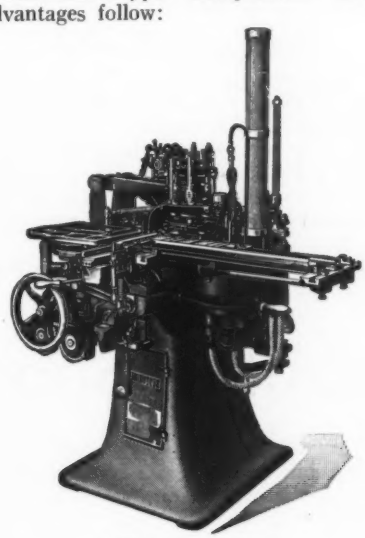
A Monotype Keyboard

2. Strip spacing material may be cast in sizes from 18 to 72 point in long lengths, or to predetermined sizes.

The Composition Caster and Keyboard. The Monotype system of straight matter composition consists of two separate parts: the keyboard and the caster. The keyboard consists of five alphabets, arranged like those of a standard typewriter. Certain keys are provided to control the spacing and justification of lines. Advantages are:

1. Keyboard and caster are separate, allowing independence of operation.
2. Up to 60-pica widths of lines are possible.
3. Six alphabets of three different type faces are combined in one keyboard operation.
4. Letterspacing is easily done.
5. The type matter may be automatically leaded, after keyboarding.
6. Several independent justifications may be made in the same line, with ease of operation on the keyboard.
7. Different point sizes may be cast in the same line and at the same time.
8. The keyboard speed is the same on all sizes of type composition.
9. Groups of six or more characters may be automatically repeated at the rate of 36,000 per hour.
10. Four point up to 18 point may be keyboarded.
11. Tabular matter, the most intricate possible, may be cast with vertical rules, and at regular casting speed.
12. The keyboard speed is limited only to the ability of the operator.

The Monotype Composition Caster advantages follow:



A Monotype Caster

1. It is especially adapted to casting justified lines of type.
2. Type can be cast on a smaller point size than the face.
3. Accuracy in casting to 2/10,000 of an inch.
4. Errors are corrected by hand. It is not necessary to recast the entire line. Machines are left open for productive work.
5. New type is available for all jobs, and no type matter is hand distributed.

The time consumed in Monotype work, according to certain authorities, adheres reasonably to the tables below:

Composition Caster and Type-and-Rule Caster

Point Size	*Pounds per Hour*
6	6 to 12
8	10 to 20
10	13 to 23
12	15 to 26
14 to 36	33

The Giant Caster

Point Size	*Low Base (Furniture) Pounds per Hour*	*Type Pounds per Hour*
14		14.5
18	105	30.2
24	75	41.8
30	80	37.4
36	75	41.3
42	70	51.0
48	70	54.6
60	60	57.0
72	50	62.1

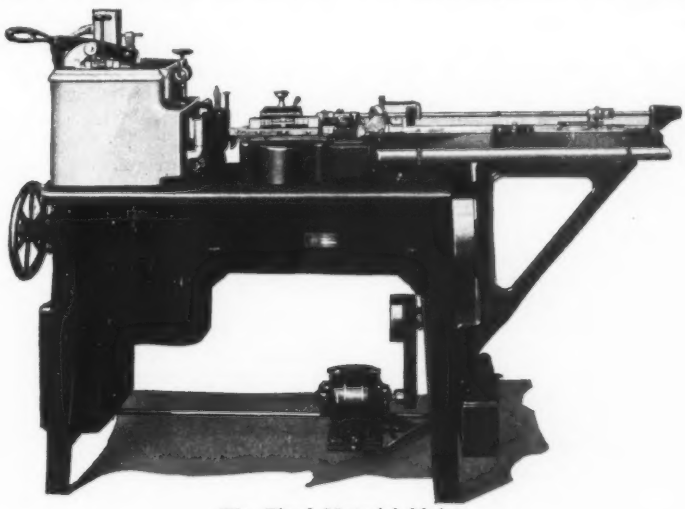
Material Makers

Material makers are machines which cast leads, slugs, rules, borders and furniture in strips and in units. Strip material is usually made 24 inches long, but may be cast and cut to pica sizes.

The Monotype Material Maker casts leads and slugs from 1½ to 18 point, line or decorative, in strips. Ornamental borders may be cast from 2 to 12 point.

The Elrod, companion of the Ludlow Typograph, casts line borders (not designs other than straight lines along the length of the slug), 2-point leads two at a time through the machine, and slugs up to 36 points in thickness.

*The All-Purpose Linotype** casts material, according to the mold equipment, from 12 point to 72 point, and in lengths of 42 picas.



The Elrod Material Maker

*The Ludlow** casts 21- or 22½-pica 6- and 12-point slugs.

The Giant Monotype casts strip material from 18 to 72 point in lengths as wanted.

The output of material, according to the manufacturers, is shown approximately in the following tables:

*These machines are not considered to be material makers in the usual sense of the term, but their "material" is used like any other.

Monotype Material Maker

Material	*Pounds per Hour*
2-point leads, low	54 to 72
2-point rules	64
6-point slugs, low	80 to 110
6-point rules and borders	90
12-point slugs, low	90 to 120
12-point rules and borders	90
18-point slugs and rules	65

The Elrod

(Leads, slugs, and borders)

Material	*Pounds per Hour*
2-point	40
2-point (twin)	70
2-point rule	35
6-point slugs	110
6-point rule	80
12-point hollow slug	100
12-point solid slug	150
18-point hollow slug	125
24-point hollow slug	130
30-point hollow slug	90
36-point hollow slug	105

Thompson Typecasters

The Monotype-Thompson Typecaster is a typefounding machine capable of making single types to be set from type cases from 5 to 48 points in size, ornaments, borders, quads and spaces, hollow quotation quads, corner quads, and tabular quadrules in either hard or regular type metal.

The machine has the particular advantage of being able to cast single types from any other type of line-casting or type-making machine. Its speed is about that of the Monotype Composition Caster.

Conclusion. During the past ten years phenomenal progress has been made in the manufacture of automatic type-casting machines. The next ten years will no doubt see many revolutionary features in machinery for making the duties of the composing-room workers easier. Perhaps, even before this article appears in print, one or two such inventions will be announced. To keep up with progress, the teacher should read the trade journals, and keep posted on changes in the profession of printing.

Automobile Trouble-Shooting Contests

Orville W. Roberts

Morton High School,
Cicero, Illinois

Directions for running these contests and a résumé of the advantages that may be gained from them.

Since 1934 the Illinois Vocational Association has featured competitive exhibits at its annual conventions. All divisions of industrial arts and vocational education are invited to participate. A great variety of shop projects are submitted and put on display to await examination by competent judges who decide place winners and make awards in each class of competition.

Any sort of fixed display purporting to show the technical knowledge and skill of auto-mechanic students would be clearly out of the question, for they neither design nor build. But, a live exhibition — boys at work on real cars — would be feasible, and shooting troubles against time and rival school teams would provide the thrill of a great game. So, the annual trouble-shooting contest for advanced auto-mechanic students has come to be a major attraction at the convention.

A synopsis of the rules will perhaps make clear the essential features of the contest. A certified eligibility list similar to those used in athletic events is required to enter a team. From this list three boys are selected by their instructors and designated to the judges as constituting the team. After the contest starts there can be no substitution. Only one team per school may be entered. A judge and a timekeeper, charged with the duties commonly performed by such officials, are stationed at each car. All cars in the contest are of the same make and model. Chevrolets, Fords, or Plymouths, preferably of current production, may be used and all instructors are notified as to which make is selected. This notification is made as far in advance of the contest as can be made with certainty. A crew of disinterested mechanics set up identical troubles in each car and information as to what these will be, is carefully guarded. There may not be more than two points of trouble in each of four divisions; namely, starting system, fuel system, ignition system, and generator-charging system. The troubles must be of such nature that they can be found and corrected with those tools ordinarily carried in the motorist's kit. When the team believes that all troubles have been found and eliminated, it reports to the judge, and the timekeeper records the elapsed time as indicated by his stop watch. After a car has been turned over to the judge as finished, the team may not return to the car to make further adjustments. When all teams have completed their work, the cars are examined and tested by the officials to determine whether or not all the troubles were eliminated. The winner is that team which, in the shortest time, found and corrected all troubles. The engine must start under control from the driver's seat, run at idle with all cylinders firing, accelerate normally, and charge the battery at the proper rate as indicated by the ammeter of the car.

A team may be disqualified for side-line coaching, breakage of any part, using an ineligible student, or unworkmanlike conduct. The decision of the judges is final.

To engage successfully in the contest, the members of the team must have a comprehensive understanding of these four important divisions of the power plant. They must think clearly under press of time and difficulty, observe the minutest details, handle small parts and tools with great skill, and recognize with certainty when the engine and its accessories are functioning correctly.

There is no substitute for hard work in preparing the team for the contest. Concentrated doses of instruction to a selected squad of nine to twelve boys for not less than twenty hours of extracurricular effort are required to select a team and whip it into shape. These units of instruction will review the theory of each system. Test papers will be called for and carefully graded. There will be discussions of possible points of trouble and demonstrations of quick tests that prove whether or not a particular point of trouble or series of them are clear. There will be interpretations of the rules and some of them memorized. Finally, there must be many practice heats with varied combinations of boys to pick the three best for the team.

Progressive dealers have cooperated generously by supplying cars to practice on and in many instances have furnished their own mechanics to set up troubles for the trial heats. Some dealers welcomed the team into their shops for practice. Factory service organizations have sent their field men into the school shops, when requested by the local car dealer, to consult with the instructor and his squad on the best procedure in servicing their cars. These contacts with responsible men in the trade have made warm friends to the cause of industrial education as may be shown by the fact that all the boys, who have served on Morton's teams, have found profitable employment in the trade upon graduation.

Material benefits have accrued to the dealers, too, if a case in point may be cited, for members of my 1934 squad purchased two used cars and a new one from the Ford dealer who cooperated so willingly in training the team.

The effect upon all auto-mechanic classes is good too, for the students are stimulated to greater effort in studying the automobile. At this time shop talk turns from baseball to trouble shooting. All boys rally to the challenge of a contest with rival schools, and this is doubly true when the shop produces a winning team.

There have been cases of experienced mechanics who, after watching the students perform, determined to study further to become more proficient in this type of service. Some men who have been in the trade long enough to be considered experts have expressed amazement at the technical knowledge and skill displayed by the winners. The effect upon instructors is interesting if not beneficial for the thrill of severe competition is a nerve tonic as stimulating as that experienced by coaches in a tight game. They prance up and down the side lines, so to speak, in nervous agitation and when a small screw is fumbled they exhibit emotions not unlike those of the coach whose team was just thrown for a ten-yard loss.

The contests have been relatively free from criticism, but there have been disappointments, and of course, alibis. They have resulted not because of faulty rules nor maladministration of them but have come from some minor slip-up in setting the troubles. For example, in one contest the function of one spark plug was to be stopped by closing its gap. But in one engine the gap was not closed tightly enough to make firm metal-to-metal contact. That engine ran perfectly because it was hot and of high compression, and the spark, though tiny, was sufficient under such conditions to ignite the charge. In the contest this year, a terminal was removed from the battery and laid against the post intending this condition to simulate the customary experience of a loose battery terminal. It succeeded as expected in all cars but one in which case the terminal fused to the post so well that the engine started under battery power at every attempt throughout the contest. In such cases the judges have ruled that the team could not be expected to look for nor remove a trouble that did not materialize. While such instances are regrettable the instructors have generally agreed that the order in which the teams finished would not have been different had the errors not occurred.

Mechanics who prepare the cars should be reminded that the points of trouble must be identical in all cars; and they must be of such construction, position, and material as to positively prevent the normal functioning of the system as intended. Last-minute decisions as to where and how to set the troubles will lead to mistakes that may cause disappointments, bitter feelings, or at least, comforting alibis. Pieces of material intended to stop the normal functioning of any part in the system should be of good design, uniform in construction, and accurately made. It is advisable to have such pieces on hand ready for the trouble setters well ahead of the contest so that they can be placed in the system with great care. Not less than an average of five minutes per point of trouble should be allowed to prepare the cars for the contest.

Many combinations of troubles are possible as may be seen by referring to the diagrams shown in Figure 1. The kind of trouble at each possible point is suggested by the letters on the diagrams which have the following interpretations:

A — insulate, short circuit, or ground the terminal
B — remove to insulate the terminal and replace
C — reverse the terminals
D — lift and insulate the brushes from the commutator
E — remove to insulate the ground terminal and replace
F — set the control linkage out of adjustment
G — insulate the contact points or set them out of adjustment
H — lift the distributor and throw out of time
I — insert plug or piece to restrict fuel flow
J — loosen or separate the joint to prevent normal vacuum
K — insert piece to hold valve wide open or closed
L — remove the control linkage

It is recognized, of course, that points of trouble other than those suggested here could be set to make the contest more difficult; but they might require a much more elaborate kit of tools than the rules allow, or extend the time of the contest beyond reasonable limits. The cars in these contests have been so beset with troubles as to require the winning team to spend from eleven to eighteen minutes to finish.

Obviously there would be considerable waste of time if all the possible points of trouble were examined; but, it would be unsafe to assume that any point is clear until proved to be so by test. So, the procedure becomes vital just as the style of play is important in any game. A team will fail not always because of incompetency but because another team used a better system. A heavy responsibility therefore rests upon the instructor for he must choose the "right" system of trouble shooting.

A great deal of time may be saved by the use of "quick tests." They will determine

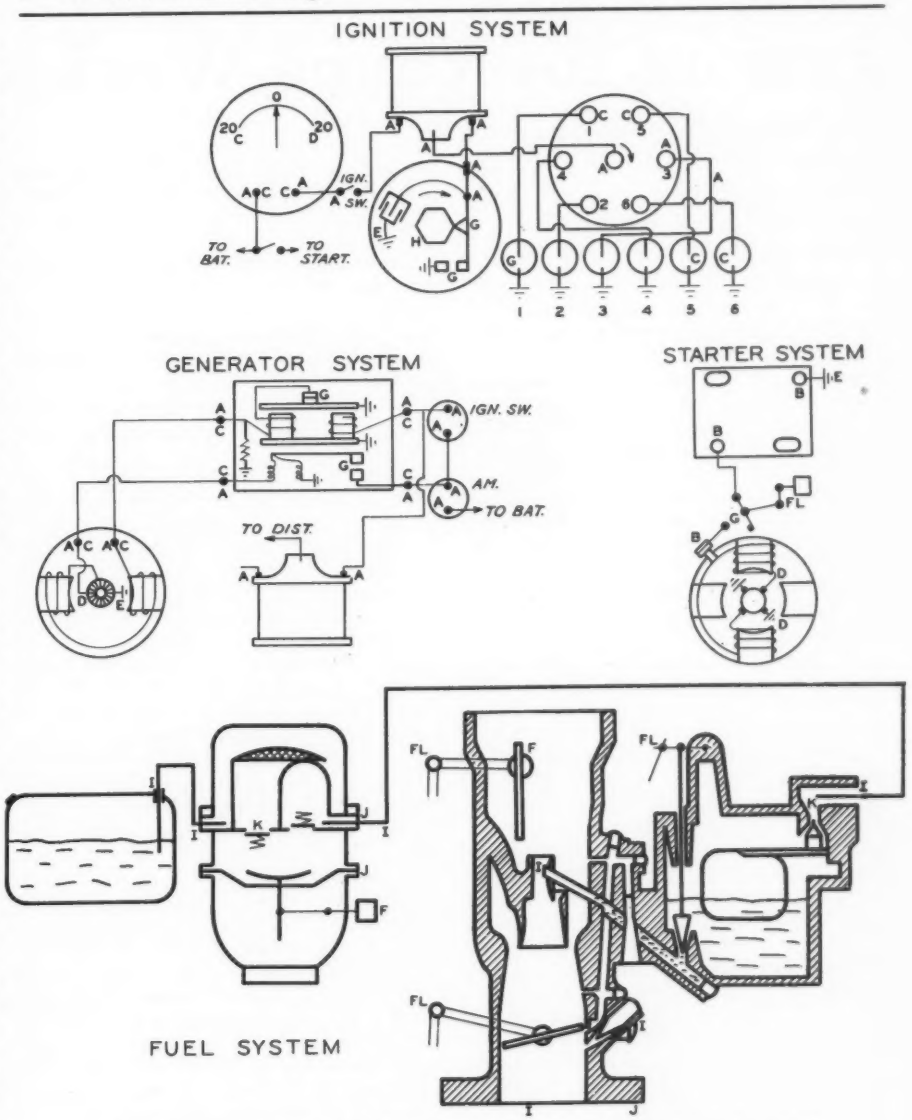


Fig. 1. Diagrams showing possible combinations of troubles that may be set up

whether or not a series of points are clear of trouble without examining each one in sequence. There are many tests of this kind. A few of them, suggestive of what may be accomplished by their use, are described briefly as follows:

Loosen the gas line at the float bowl. Crank the engine several revolutions. Regular impulses of fuel squirting through the loose joint makes it fairly safe to assume that the fuel pump will function in a normal fashion.

Snap open the throttle. If fuel squirts through the jets into the throat of the carburetor it shows that certain passages are clear and that there is sufficient fuel in the float bowl for starting.

Close or shunt the generator reverse-current relay points. A sharp kick felt at the generator pulley suggests that the brushes and their leads are O.K.

Ignition switch *on*. Hold the distributor-cap end of the secondary wire about one fourth inch away from a good ground. Snap open the interrupter points. A "hot" spark at this gap will prove the function of induction to be sufficient for ignition.

"Flash" the battery-cable terminal at the starter switch. A very heavy spark proves the battery-cable connections to be good enough for starting.

Whenever a quick test reveals that trouble exists somewhere in the system preceding that point, other tests and examinations must be made in some systematic process of elimination to determine the exact point of stoppage. The team with the greatest number of quick tests in its repertoire has a better chance of winning, for they save time, and time is a chief factor in these events. What about the factor of *luck?* There is scarcely any competition in which luck does not play some part for the winner. But like all true games, the team with the greatest skill and deepest understanding wins.

Our most spectacular contest was that of 1938 at Lane Tech of Chicago when thirteen teams competed. Enough cars, one for each team, were furnished by a local Chevrolet dealer who sent also a competent crew of mechanics to serve as judges, timekeepers, and trouble setters. Representatives from the car manufacturers, the Chicago Automobile Club, the A.A.A., the metropolitan press, and other important men of the industry attended the contest as observers. In addition to the required ribbon awards there were valuable prizes given to individuals of the team and to the school shop to which the winning team belongs.

Teams from Chicago, Cicero, Champaign, Des Plaines, Joliet, Moline, Pullman, and Rockford are commonly entered in these contests. It is customary for the school to defray most of, if not all, the expenses incident to sending its team to the contest.

Finally, it is only fair to recognize that the success of these annual events has been due to the fine work of V. O. Wiley, Pullman; D. M. Dean, Lane Tech, Chicago; C. K. Anderson, Tilden Tech, Chicago; and H. R. Ong, Champaign.

Lessons for Young Workers — XII

Thomas Diamond

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Ann Arbor, Michigan

The twelfth of a series of lessons for students of industrial arts and vocational education.

WAGES AND THE COST OF LIVING

A great deal is heard about the high cost of living, and there is much agitation for the increase of workers' wages in order that they may be able to buy as much as they were in the habit of buying when prices were low.

Unfortunately these increases in wages do not solve the difficulty because the cost of living refuses to remain stationary when wages are going up. The worker, not understanding why he receives no benefit from his increase, is likely to blame the "capitalist," the "profiteer," or "Wall Street" for the decreasing amount he is able to obtain for his dollar.

If only a few individuals received an increase in wages, and the rest of the world went on as before, these few might realize the benefit of increased wages. Unfortunately when one group receives higher wages for making some article the rest of the people who have to buy it have to pay more for the article on account of the increased cost of making it. As they cannot buy as much with their dollar as they did formerly it becomes necessary for them to receive an increase in their wages to help them meet the higher price. As soon as their wages are increased the articles which they make are also increased in price which again means that the worker who buys these articles gets less for his dollar than he did formerly.

As an example of this, a story might be told of a furniture manufacturer in Michigan who wanted some lumber with which he proposed to make furniture. This lumber had to be obtained from Oregon and before it could be shipped a lumberjack had to go into the woods and cut down the trees.

The lumberjack knew that the furniture manufacturer was quite anxious to get the material, so he concluded that it was a good time to demand an increase in his wages. Because of the pressing demand for the lumber the increase was granted, the lumberjack went to work, and very soon the logs or the boards were on their way East.

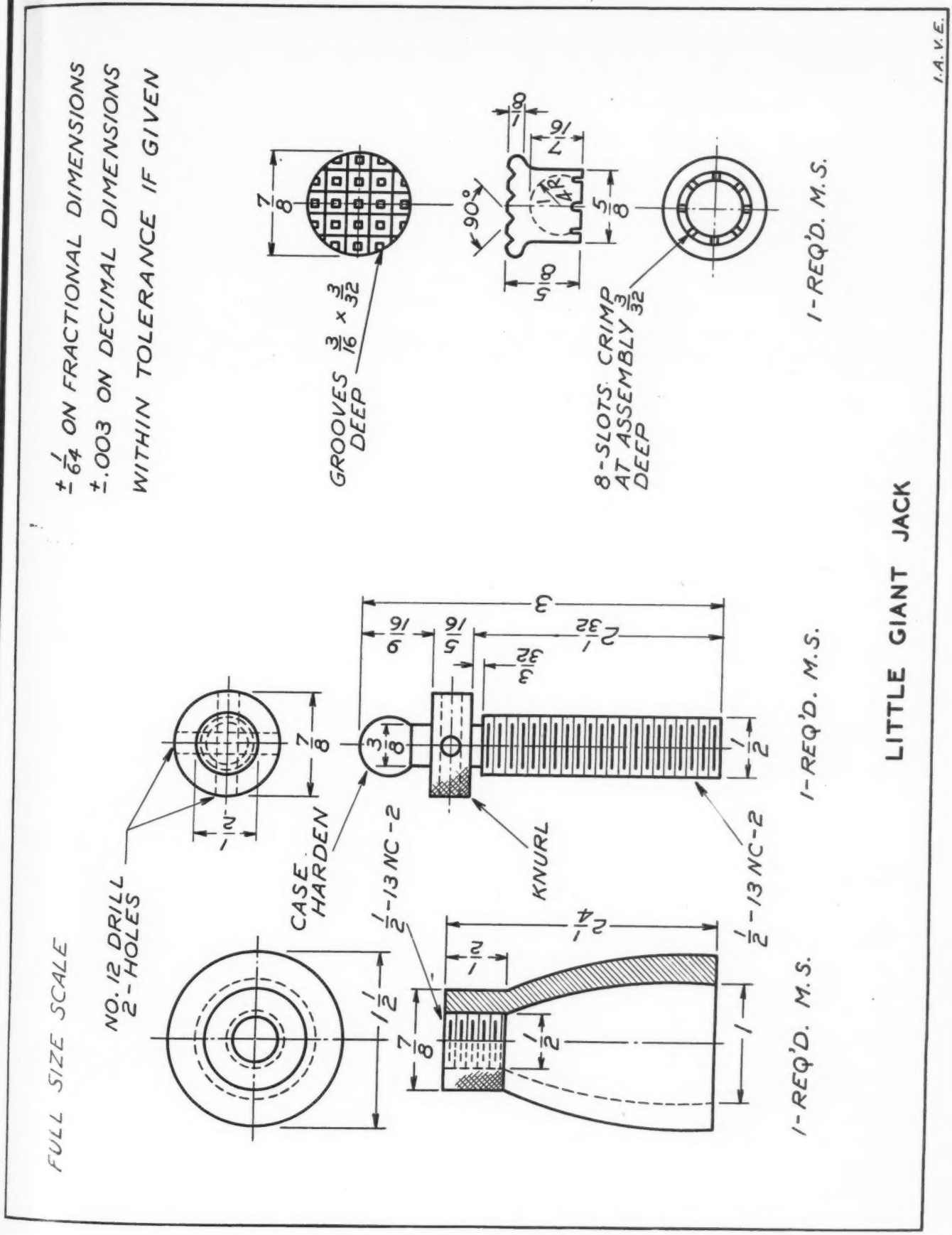
When the furniture manufacturer received his bill for the lumber he found that the price had been increased in order to pay the extra money to the lumberjack. To enable him to pay this extra charge he, in turn, increased the price of his furniture and placed it upon the market.

Our friend the lumberjack was so pleased with his increase in wages that he decided he could afford to get married. As he wished to furnish a home he had to buy some furniture and happened to buy some of the articles manufactured from the log he had cut. Imagine his astonishment when the dealer informed him that the cost of furniture had just gone up, and that he would have to pay more than he had planned.

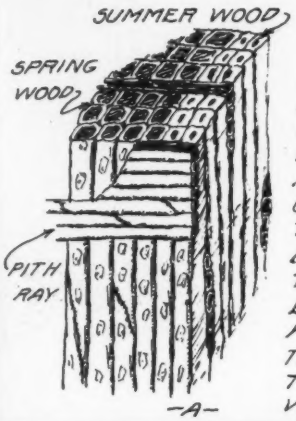
He was so angry about what he called this "profiteering" that he went back to work and demanded another increase in wages to meet this increase in the cost of living. As the furniture manufacturer still needed lumber, the employer of the lumberjack consented to the second increase and immediately increased the price on the next load to Michigan to help him pay the extra to his man. Of course, the furniture man increased the price of the next load of furniture to pay for the increased cost of lumber.

This might have been the end of the story, but the lumberjack was so pleased with the result of his second demand that he decided to furnish a bedroom that had been neglected when he started housekeeping. When he went to the store he was informed that the price of furniture had gone up again, and if he wanted the new pieces he would have to pay out all the extra money he had received as a result of his increase in wages. The result of this was that, although he was getting higher wages, he was not getting any more furniture than he could have obtained with lower wages, if the price had not been increased.

You will notice that we have only mentioned the increase received by the lumberjack. His increase made it necessary to increase the price of furniture, but he was not the only one who had to pay the increased price. The engineer, the fireman, the brakeman, the train dispatcher, and all the rest of the railroad men who helped transport the lumber to Michigan and the furniture back to Oregon had to pay it also. If the lumberjack deserved an increase to meet the increased cost of living, they deserved it also. The money needed to pay them had to be charged against the things they handled, and as lumber and furniture were among these

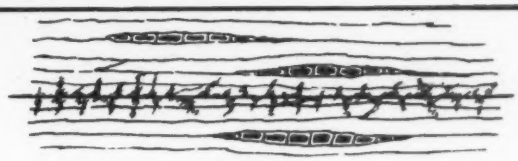

I.A.V.E.
±1/64 ON FRACTIONAL DIMENSIONS
±.003 ON DECIMAL DIMENSIONS
WITHIN TOLERANCE IF GIVEN
GROOVES 3/16 x 3/32 DEEP
90°
8-SLOTS CRIMP AT ASSEMBLY 3/32 DEEP
1-REQ'D. M.S.
LITTLE GIANT JACK
NO. 12 DRILL 2-HOLES
CASE HARDEN
1/2-13 NC-2
KNURL
1/2-13 NC-2
1-REQ'D. M.S.
1-REQ'D. M.S.
1-REQ'D. M.S.
FULL SIZE SCALE

GLUE

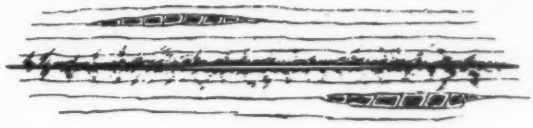


-A-

ALL WOOD IS MADE UP OF HOLLOW FIBERS AND CELLS, WITH IRREGULARITIES BETWEEN. IN A GOOD TIGHT JOINT, AS SHOWN AT -B-, THE GLUE IS PRESSED INTO THESE CELLS AS SHOWN BY THE SHADED LINES. THEY ARE LIKE A MILLION JAGGED NAILS, REACHING BOTH WAYS. THE GLUE SOAKS INTO THE VERY FIBER OF THE WOOD ITSELF.


-B-

ABOVE IS SHOWN A CLOSE-FITTING JOINT. THE GLUE ENTERS THE CELLS.


-C-

THIS IS AN OPEN JOINT. GLUE IS QUITE BRITTLE BY ITSELF. IN A CAKE OR SHEET.

"I LEND MY ARM TO ALL WHO SAY: 'I CAN'"

THE OPERATION— To learn how to properly use glue and what precautions to take.

MATERIALS— The kind of glue to use depends upon the nature of the work, the place where it will be used, the ability of the worker, etc.

Liquid glue, which is used cold, is usually made from fish scales and tissues. LePage glue is an example. This glue is easily handled and as it does not set or harden nearly as rapidly as hot glue, it is better for a beginner, or in places where the gluing will take a long time.

Hot glue, of the best quality, is prepared from tough, transparent sheets of glue. It is obtained from the hides of oxen. Lower grades are made from cattle, pigs, horses, etc., such parts as feet, sinews, bones, etc. being used. After breaking the sheets into small pieces, cover with cold water and allow to stand over night. Heat to the proper temperature in a glue heater. Heating above 150° destroys its strength. It should not be used when thick and gummy nor when thin like water. About the consistency of cream is right. Hot glue has greater strength than cold and should be used in preference. It must be handled very rapidly, the whole operation finished and the work tested in a few seconds.

Waterproof glue can be made by adding one part of potassium bichromate to fifty of the glue.

TOOLS— Bar clamps, hand screws or other holding tools, square or straight edge.

DIRECTIONS— 1- Preparation. Many glue joints are ruined by not being ready. Check these points carefully:-

a- Does the joint fit securely, with all parts and surfaces making complete contact?

b- Have you assembled work to be sure everything fits?

c- If using hot glue, have you tested it for consistency? It should not be thick, but rather it should run from the brush like cream.

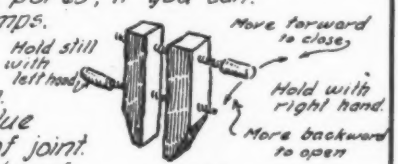
d- Have you warmed the joint?

e- Are all clamps adjusted and in readiness to use with blocks of wood handy to protect work? Rehearse the work.

2- Divide the job into parts. On tables, etc., glue end sections first. When using dowels, glue them in one side first. Remove the glue.

3- Apply the glue. Do this as quickly as possible, working in holes first, assembling work whenever possible, viz., tenons, etc. Do not glue panels. Rub wood together to help glue penetrate pores, if you can.

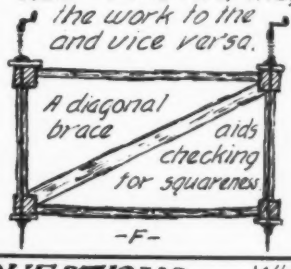
4- Adjust clamps. Care should be taken to alternate them. Tighten until glue squeezes out of joint. Examine all sides of joint for a tight fit. Apply clamps so they will bring work up true. See sketch -F-



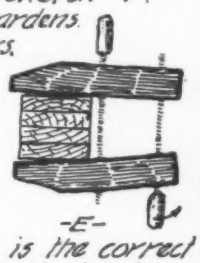
-D-
A Handscrew.

5- Remove glue before it hardens. Allow work to set 5 or 6 hours.

If the bar clamps below slant to the left, they pull the work to the right and vice versa.



-F-


-E-

This is the correct position just before tightening outside handle. Tighten until completely closed.

QUESTIONS— Why is it that filling a bad joint with glue does not improve it? Can clamps draw square work out of true? What care should be taken in applying clamps? Why are the clamps alternated when applied? Why should the cover always be replaced on the cold glue? What care should be taken of any glue container?

Submitted by Clifford B. Smith, Buffalo, New York

articles, very naturally these became more expensive because the freight rates on them had to be increased to pay the men who handled them.

Thus something else was added to the cost of the furniture; moreover, it did not end here. The man who made the furniture, the man who wholesaled it, the man who retailed it, and many others were also entitled to an increase in their wages because they were compelled to pay more for their furniture.

In short, everyone who buys furniture has to pay more for it because of the increase demanded by the lumberjack. Each one, in his turn, asks for an increase in his wages to meet the increased price, which automatically increases the price of the articles he is helping to make or the service he is rendering.

Thus the cost of living goes up as a result of increasing wages, wages again go up on account of the increased cost of living, and once more the cost of living goes up on account of the increase in wages. This may go on as far as one cares to carry it.

The lessons to be learned from this are that:

1. Each increase in wages had to be paid for out of the price received for the goods manufactured.
2. The worker is the largest consumer of goods so he is called on to pay most of the increase in prices made necessary by any increase in wages that he receives.
3. It is not possible to catch up on the cost of living when it rises due to increased wages.

Questions for Discussion

1. Can you give any examples of the increased cost of living?
2. Do you know of any trades or jobs in which wages have gone up in the past two years? What were the reasons given for the increase?
3. What effect would this increase have on the price of the article these men manufactured?
4. If the price of the article were increased what effect would it have on the cost of living?
5. What would people have to do to meet the new conditions?
6. What effect would their action have on the cost of living of the people who bought their goods? How far could this be carried?
7. Do you believe that increasing wages is the correct way to cope with any tendency on the part of the cost of living to increase?
8. Can you imagine any way in which the lumberjack might have received his increase without affecting the price of the lumber?

Testing and Tests

MACHINE-SHOP TEST

Fred E. Decker, Detroit, Michigan

Name .....
Age..... Grade.....
Corrected by.....

	Parts	Score
	1 (1– 25)	.....
	2 (26– 50)	.....
	3 (51– 75)	.....
Hour.....	4 (76–100)	.....
	5 (101–110)	.....
	6 (111–132)	.....
	Total	.....

General Directions: This test will take approximately forty minutes. Read the directions for each part carefully. It will not be necessary to ask questions.

Part I. Yes-No (1–25)

Several questions follow, some of which should be answered by yes and others by no. If the answer should be yes, draw a circle around the letter *Y*, and if no, circle the letter *N*.

1. Y N Is it necessary for you to be able to read a working drawing?
2. Y N Will you learn to read a working drawing in making out a bill of material for doing the job?
3. Y N In the industrial world are plans and procedures carefully thought out in advance?
4. Y N Are one-piece rules most commonly used by the metalworker?
5. Y N When measuring distances less than the length of the rule, would you place the rule on edge?
6. Y N Does the power hack saw cut on the drawn stroke?
7. Y N Will soluble oil dissolve in warm water?
8. Y N Would you use a pair of inside calipers to lay out a circle?
9. Y N When stamping your first initial and last name on a job or project with steel letter stamps, should the spacing between letters be 1/16 in.?
10. Y N Are some hand hack-saw blades made of tungsten alloy steel?
11. Y N Will the *flexible* type of hand hack-saw blade break as easily as the *all-hard* type?
12. Y N Would you use a mill file for draw-filing?
13. Y N Is a file a piece of hardened steel with its faces covered with teeth?
14. Y N Can an outside caliper be set to a rule?
15. Y N Are there six essential parts to a micrometer caliper?
16. Y N Is the beveled edge of the thimble on the micrometer caliper divided into twenty-five equal parts?
17. Y N Is .475 the decimal equivalent of the fraction 3/8 of an inch?
18. Y N Are the spiral grooves of a twist drill called flutes?
19. Y N Is the size of a twist drill usually stamped on the body of the drill?
20. Y N Is it possible to smooth and polish metal in the lathe?
21. Y N Is emery cloth available in sheets 9 by 9 in.?
22. Y N Must a broken center drill be annealed before it can be drilled out of a piece of metal?
23. Y N Is casehardening one method of heat treating steel?
24. Y N Is a dark straw color a common temper color?
25. Y N Can you shear metal with a vise and a monkey wrench?

Part II. True-False (26–50)

Read each item below and decide whether it is true or false. If the item is true, circle the letter *T* at the left, if the item is false, circle the letter *F*.

26. T F Always chip toward the solid vise jaw when chipping cast iron or other metals.
27. T F Ordinarily a one-pound ball-peen hammer is about the right weight to use when chipping with a 3/4-in. flat cold chisel.
28. T F A drilled hole is countersunk to set the head of a rivet or machine screw flush with the surface of the work.
29. T F A countersunk hole may be checked by holding the rivet or screw upside down.
30. T F For drilling and countersinking the ends of a piece of work to be machined on centers, the combined drill and countersink is the most practical.
31. T F When the diameter of the work to be center drilled is 3/8 to 1 in. in diameter, the large diameter of the countersunk hole should be 3/16 in.
32. T F The drilled hole for the stem of the rivet should be 1/16 to 1/8 in. larger than the stem of the rivet.
33. T F Riveting is one of the oldest methods of joining metal together.
34. T F To clean and oil a machine, use waste or rags moistened with kerosene to cut the grease and then apply a few drops of oil.
35. T F A mixture of turpentine and kerosene is often used in drilling extra hard metal.
36. T F The round-nosed turning tool is used for general machine work.
37. T F The right-hand-side tool is intended for facing of the ends of shafts and for machine work on the right side of the shoulder.
38. T F The round-nosed turning tool may be fed in either direction when the top of the bit is ground flat.
39. T F The combined drill and countersink is always 82 deg.
40. T F Centers of round stock may be located with hermaphrodite calipers.
41. T F By turning the tailstock handwheel to the right, the hard

center of the lathe will be loosened.

42. T F Facing is done to get the ends square and clean and also to get the work to the proper length.
43. T F Facing is sometimes called squaring.
44. T F Feed is the amount the tool travels or advances along the work with each revolution of the work.
45. T F Before inserting centers in the tapered spindles of a machine the centers and spindles should be thoroughly cleaned.
46. T F The soft lathe center is placed in the tailstock of the lathe.
47. T F If the jaws of the lathe chuck move all together, the chuck is called an independent chuck.
48. T F In truing a soft lathe center to a point, the tool bit should be exactly on center.
49. T F An abrasive is an extremely hard and tough substance which has many sharp cutting edges.
50. T F The hard lathe center has some mark to denote that it is hard.

Part III. Multiple-Choice (51–75)

In each item below, underline the correct answer and write its number in the parentheses at the left.

51. ( ) The amount of taper is determined (1) on one half the length of the work, (2) the entire length of the piece, (3) on one fourth the length of the piece, (4) on the radius, (5) on one third the length of the work.
52. ( ) The (1) Morse Standard Taper, (2) Browne and Sharpe, (3) American, (4) Sellers taper is used chiefly on head- and tailstock spindles of lathes.
53. ( ) Polishing in the lathe is usually done with (1) waste, (2) sandpaper, (3) emery cloth, (4) clean cloth, (5) oilcloth.
54. ( ) For accuracy in taper turning, the taper should be tested (1) before taking a cut, (2) after taking a cut, (3) any time, (4) when completed, (5) just before taking a cut.
55. ( ) When knurling, one should run the lathe at (1) a high rate of speed, (2) very high speed, (3) back gears in, (4) slowest speed back gear, (5) highest speed back gear.
56. ( ) There are (1) one, (2) three, (3) two, (4) four, (5) five grades of knurling.
57. ( ) The lead of a thread is the distance it will move into the nut in (1) one, (2) two, (3) four, (4) three, (5) five revolutions.
58. ( ) The most commonly used drill is the (1) flat, (2) straight fluted, (3) twist, (4) square drill.
59. ( ) A twist drill is held by the (1) shank, (2) body, (3) point, (4) flutes, (5) lips.
60. ( ) Number drills are (1) smaller than letter drills, (2) larger than letter drills, (3) the same size as letter drills, (4) larger than ½-in. drills, (5) larger than ⅜-in. drills.
61. ( ) An independent lathe chuck has (1) one, (2) four, (3) six, (4) seven, (5) eight jaws.
62. ( ) A boring tool has a tendency to spring (1) up, (2) down, (3) toward the top, (4) not to spring.
63. ( ) Reamers should be turned (1) clockwise, (2) counterclockwise, (3) to the left, (4) up, (5) out.
64. ( ) Use oil when reaming (1) cast iron, (2) steel, (3) glass, (4) carbon, (5) lead.
65. ( ) Hand reamers may be started easily by "spotting" a hole to a depth of ⅛ in. with a drill (1) the same size as the reamer, (2) smaller, (3) larger, (4) any size.
66. ( ) Steel mandrels are hardened and tempered and the surface that receives the work is ground to a taper of about (1) .009, (2) .006, (3) .008, (4) .003, (5) .010.
67. ( ) There are (1) two, (2) three, (3) four, (4) five methods of taper turning in a lathe.
68. ( ) For turning and boring tapers, the tool should be set (1) exactly at the center of the work, (2) below, (3) above, (4) near the center of the work being tapered, (5) 5 deg. above center.
69. ( ) Turning or boring a taper by use of the compound rest is one of the (1) two, (2) three, (3) four, (4) six methods.
70. ( ) A greater number of threads per inch is found on the (1) N.C., (2) N.F., (3) E.F., (4) N.P.T., (5) Briggs.
71. ( ) For tapping a blind hole you would use the tap set in this order, (1) taper, bottoming and plug, (2) plug, taper and bottoming, (3) taper, plug and bottoming, (4) plug and taper, (5) taper and plug.
72. ( ) Breakage of taps is caused by (1) a small tap wrench, (2) too much oil, (3) starting the tap crooked, (4) using too large a tap drill.
73. ( ) Tap sets are made in (1) plug, machine and taper, (2) taper, aero and tap, (3) taper, plug and bottoming, (4) taper and plug.
74. ( ) The radius of a circle is any line drawn from the center to the (1) diameter, (2) center, (3) circumference, (4) square.
75. ( ) Tool bits are usually made of (1) low-carbon steel, (2) high-speed steel, (3) duralumin, (4) wrought iron.

Part IV. Single-Answer (76–100)

Place the correct word in the blank space to make the sentence complete and correct. The figure in the parentheses indicates the number of letters in the answer.

76. There are one, ... (3), and ..... (5) view drawings.
77. Jobs that will not fit on the drawing paper are drawn to ..... (5).
78. A job or project is a problem that requires ..... (8).
79. The "All-hard" hand hack-saw blade will break easier than the ..... (8) blade.
80. A ..... (4) nut at the end of the hand hack-saw frame allows the blades to be removed or tightened to the proper tension.
81. A ..... (4) is a piece of steel with its faces covered with teeth.
82. Use a ..... (9) tooth-per-inch hand hack-saw blade on small tubing, conduit, and sheet metal less than 18 gauge.
83. .300 is indicated by the line 3 on the ..... (7) of the micrometer caliper.
84. Micrometers form an accurate way to make ..... (7) measurements.
85. Cleaning should be done while the machine is ..... (4).
86. Emery cloth is available in sheets ..... (4) x 11 in.
87. The angle of the center drill is always ..... (5) degrees.
88. When the diameter of the work to be center drilled is ⅜ to 1 in. in diameter, the large diameter of the countersunk hole should be ..... (15) of an inch.
89. ..... (6) is done to get the ends square and clean and also to get the work to the proper length.
90. The hard center is placed in the .... (9) of the lathe.
91. ..... (6) are manufactured in the common soft metals.
92. In truing a soft lathe center the compound rest is set at ..... (6) degrees with the line of lathe centers.
93. Friction between moving parts may be lessened by the use of ..... (3).
94. If the work is small near the tailstock, the tailstock will have to be moved toward the ..... (4) of the lathe in order to get a straight cut on your work.
95. Taking a heavy cut is called .... (8).
96. When the work has been turned to within about 1/32 in. of the finished size, take a ..... (9) cut.
97. Cutting speed in any machine-shop operation is expressed in feet per ..... (6).
98. If the jaws of the lathe chuck move all together, it is called a ..... (9) chuck.
99. There are ..... (5) grades of knurling.
100. The purpose of reaming is to obtain a standard-sized hole, round, and .... (6).

Part V. Matching Test (101–110)

At the left you are given ten common machine-shop terms, in a mixed order. In the parentheses at the left and in front of the word insert the number which precedes the correct meaning of the term written at the right.

101. ( ) Scribing.		1. To make smooth with emery cloth.
102. ( ) Polish.		2. To duplicate designs on metal by drawing lines around the pattern.
103. ( ) Center Drill.		3. A process of making work smooth by filing.
104. ( ) Draw-filing.		4. A device to hold work.
105. ( ) Work Centers.		5. A tool used for drilling center holes.
106. ( ) Lathe Dog.		6. The drilled and countersunk ends upon which work depends for a substantial mounting.
107. ( ) Laying Out.		7. To make holes in metal.
108. ( ) Punching.		
109. ( ) Rivet Set.		
110. ( ) Foundry.		

8. A tool used for rounding the heads of rivets.
9. The setting off or marking off of work to full size.
10. A building in which metal castings are made.

Part VI. The Procedure Arrangement Test (111–132)

The list contains a number of common jobs done in the machine shop. The proper steps are listed for carrying out the job, *but these steps are not in the correct order*. Examine each job in order and decide which step should come first. Place the number of this step in the pair of parentheses at the left. In the same way place the numbers of the remaining steps in the proper order.

I. To grind a round-nosed lathe-tool cutter bit. (Six steps.)

111. ( ) Grind the left side of the cutter bit to the proper angle.
112. ( ) Grind the correct front clearance angle.
113. ( ) Grind the right side of the bit to the proper shape and angle.
114. ( ) Hone the cutting edge and top of the bit with an oilstone.
115. ( ) Grind the back rake on the bit.
116. ( ) Round the end of the cutter bit.

II. To mount work in a four-jaw independent lathe chuck. (Five steps.)

117. ( ) Revolve the spindle slowly and with a piece of chalk mark the high spot on the work while it is revolving.
118. ( ) When the work is running true in the chuck, tighten each jaw one after another in sequence, until all four jaws are clamping the work securely.
119. ( ) Adjust the jaws to receive the work.
120. ( ) Stop the spindle, locate the high spot on the work and adjust the jaws in the proper direction to true the work.
121. ( ) Fasten the work in the chuck by turning the adjusting screws of the chuck.

III. To prepare a piece of round stock for turning between centers. (Five steps.)

122. ( ) Lay out the length.
123. ( ) Saw the stock to correct diameter and length.
124. ( ) Face one end of the stock and center drill to proper depth.
125. ( ) Chuck stock accurately in a four-jaw independent chuck.
126. ( ) Face the second end to correct length and center drill.

IV. To drill holes in a flat piece of metal. (Six steps.)

127. ( ) Grind the drill if necessary.
128. ( ) Carefully lay out the exact center of the hole and center punch.
129. ( ) Arrange to hold the metal securely.
130. ( ) Determine the size of the hole and select the drill.
131. ( ) Select the drilling tool, hand drill, electric drill (hand) brace, electric bench drill or drill press.
132. ( ) Drill the holes.

KEY

Part I

1. Y	6. Y	11. N	16. Y	21. N
2. Y	7. Y	12. Y	17. N	22. Y
3. Y	8. N	13. Y	18. Y	23. Y
4. Y	9. Y	14. Y	19. N	24. Y
5. Y	10. Y	15. N	20. Y	25. Y

Part II

26. T	31. T	36. T	41. F	46. F
27. T	32. F	37. T	42. T	47. F
28. T	33. T	38. T	43. F	48. T
29. T	34. T	39. F	44. T	49. T
30. T	35. T	40. T	45. T	50. T

Part III

51. 2	56. 2	61. 2	66. 4	71. 3
52. 1	57. 1	62. 2	67. 2	72. 3
53. 3	58. 3	63. 1	68. 1	73. 3
54. 2	59. 1	64. 2	69. 2	74. 3
55. 4	60. 1	65. 1	70. 3	75. 2

Part IV

76. Two, three	85. idle	93. oil
77. scale	86. nine	94. back
78. solution	87. sixty	95. roughing
79. flexible	88. three	96. finishing
80. wing	sixteenths	97. minute
81. file	89. facing	98. universal
82. thirty-two	90. tailstock	99. three
83. sleeve	91. rivets	100. smooth
84. outside	92. thirty	

Part V

101. 2	102. 1	103. 5	104. 3	105. 6
106. 4	107. 9	108. 7	109. 8	110. 10

Part VI

111. 1	112. 3	113. 2	114. 6	115. 5
116. 4	117. 3	118. 5	119. 1	120. 4
121. 2	122. 4	123. 1	124. 3	125. 2
126. 5	127. 4	128. 1	129. 5	130. 3
131. 2	132. 6			

Problems and Projects

LITTLE GIANT JACK

Edwin M. Moe and W. H. Bugg, Morton Senior High School, Richmond, Indiana

The jack shown on the working drawing, page 331, is a very handy tool for planer and milling-machine work.

Steps in making the base:

1. Chuck up a piece of mild steel 1⅝ by 2 5/16 in.
2. Drill a 27/64-in. hole through it.
3. Face end.
4. Bore inside to shape
   a) With ¾-in. drill, drill 1¼ in. deep.
   b) With a 15/16-in. drill, drill ⅞ in. deep.
   c) Bore to shape.
5. Tap base
   a) Support shank end of tap on dead center while tapping to insure tapped hole being true with center line of jack.
6. Mount base on a threaded mandrel with bored end supported by a tapered shoulder.
7. Turn outside to fit a template.
8. Knurl
9. Face to length.

The threads on the screw are machine cut, using the base as the female gauge to test the threads. The ball is made last and can be finish formed best by placing the threaded portion in a ½-in. draw-in collet. If this is carefully done neither the threads nor the collet are injured.

Another method of forming the ball is to chuck up a piece of scrap stock at least 1 in. in diameter and 1 in. long. Drill and tap as directed. Face, and test by screwing a jack screw into it. This method is the best, but it entails holding up one chuck while class finishes this project, or else using a considerable number of pieces for all the members of the class. If a 1-in. draw-in collet is available, this piece could be made from a piece of 1 in. C.R.S. and be used by the entire class.

When the screw is finished, the ball may be casehardened although this is not necessary.

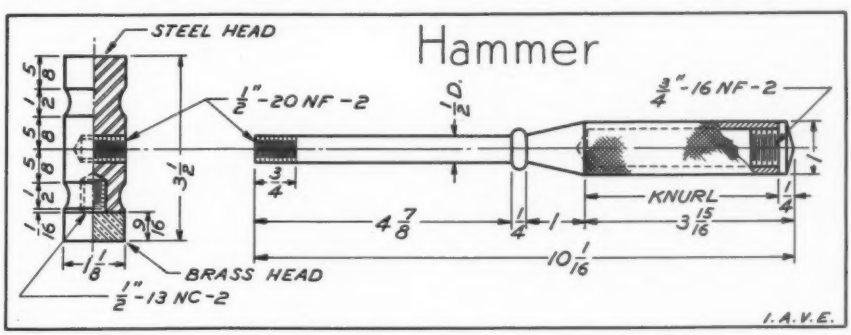
HAMMER

Eugene V. Clarke, High School, Bend, Oregon

The hammer shown herewith represents a project for the young machinist who has just finished his process exercises. The processes included in its making embrace the following: Between center turning, chuck turning, facing, taper turning, shaping inside and outside curves, knurling, lathe drilling, boring, inside lathe threading, outside lathe threading, soft metal turning, tapping and lathe threading, finishing and polishing.

The final project is a nicely balanced and very useful hammer for the shop.

With the exception of the brass head, the entire project is made of auto axle steel.



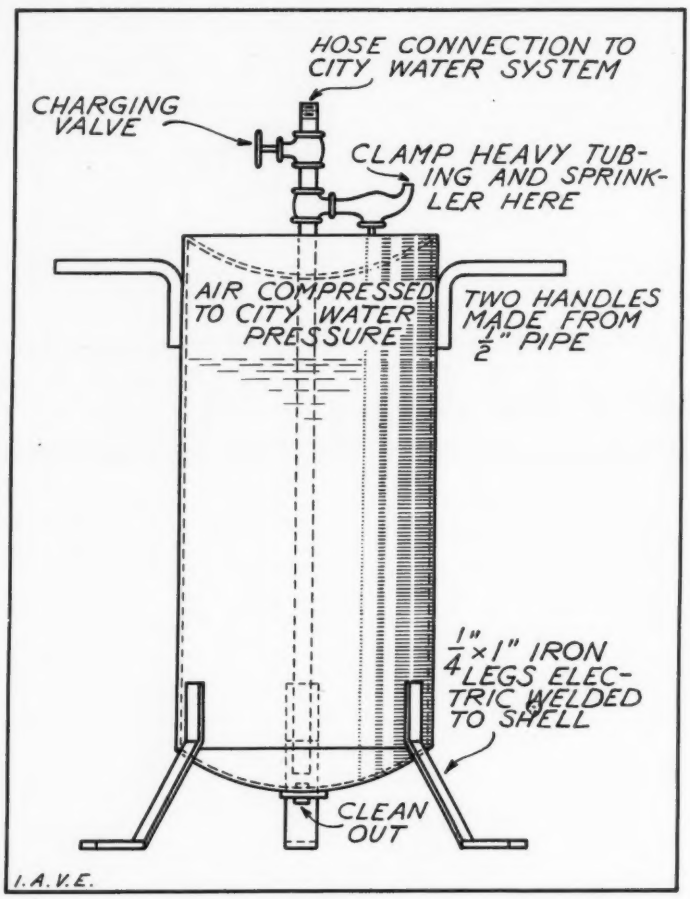
SANITARY WATER CARRIER FOR ATHLETIC TEAMS

F. H. Parrish, Dallas, Oregon

The use of this portable water tank is the way in which a small high school overcame the unsanitary water bucket and sponge for its teams. The water in the tank is under pressure equal to that in the city water system.

A small tank, of approximately five gallons capacity, and capable of withstanding at least 100 pounds pressure was purchased from a plumbing-supply dealer. Three feet, spaced equally about the bottom of the tank, were electric welded to the shell. Two handles, of ½-in. pipe, were welded to the shell near the top, making it convenient for two boys to carry the tank on and off the field.

The sketch illustrates the way the tank was fitted. The center pipe is about 1 in. from the bottom of the tank. At the top end of the pipe is fitted a valve with a hose connection and a plain bibb with a spring-operated handle. A length of heavy rubber tubing is clamped to the bibb. At the end of the tubing is a small sprinkler, or a bubbler head. The boys can use this for either drinking or spraying their faces to wash off mud and perspiration.


HOSE CONNECTION TO CITY WATER SYSTEM
CHARGING VALVE
CLAMP HEAVY TUBING AND SPRINKLER HERE
AIR COMPRESSED TO CITY WATER PRESSURE
TWO HANDLES MADE FROM 1" PIPE
1" × 1" IRON 4 LEGS ELECTRIC WELDED TO SHELL
CLEAN OUT
I.A.V.E.

Water carrier

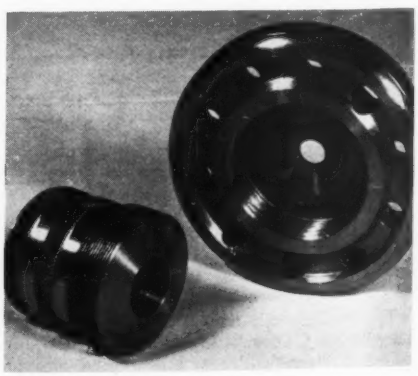
To charge the tank connect a length of hose between the tank and city water system. Open the charging valve and turn on the water. As the water flows into the tank from the bottom the air will be compressed into the top until it is equalized with the city pressure. Close the charging valve before disconnecting the city water. The tank will supply plenty of fresh, clean water through an entire half of a football game. The plug in the bottom is used for draining and sterilizing the tank. More than one sprinkler can be fitted to the tank. This size tank fits very nicely into buses when the teams are traveling to games away from home.

SPRING-CHUCK HOLDERS

Edward N. Wallen,
Textile High School, New York City

Spring chucks (sometimes called collets or bushings) are essential equipment in any machine shop. They are unexcelled for the holding of small diameter rods, etc. The usual spring-chuck equipment consists of an adapter which is placed in the spindle of the lathe to receive the chuck, a thread protector which is screwed on to the threaded portion of the spindle, and a draw-in tube or drawback as it is also called. The drawback is a long hollow piece threaded at one end to engage the threads of the spring chuck and fitted with a hand wheel at the other end. In use the spring chuck is drawn back into the tapered seat of the adapter and is thus closed down upon the piece which is being held.

The limitation of spring chucks is in the small range or adjustment which they possess. A chuck must be selected for a standard size rod, say a ¼ in. diameter. If the rod is a little oversize, the unskilled may attempt to force the piece into the chuck. If the piece is a few thousandths small, the effort is made to draw the spring chuck back farther in the adapter. The lathe spindle is locked by means of the back gears and the thoughtless user puts his back into the task of tightening up the chuck. The threads in the end of the drawback are small. They may be crossed with the spring-chuck threads and since the spring chuck is hardened, the results are damaging to the drawback. The adapters are equipped with a small key which is intended to keep the chuck from turning while it is being tightened. These keys are often cut by the keyway of the chucks.

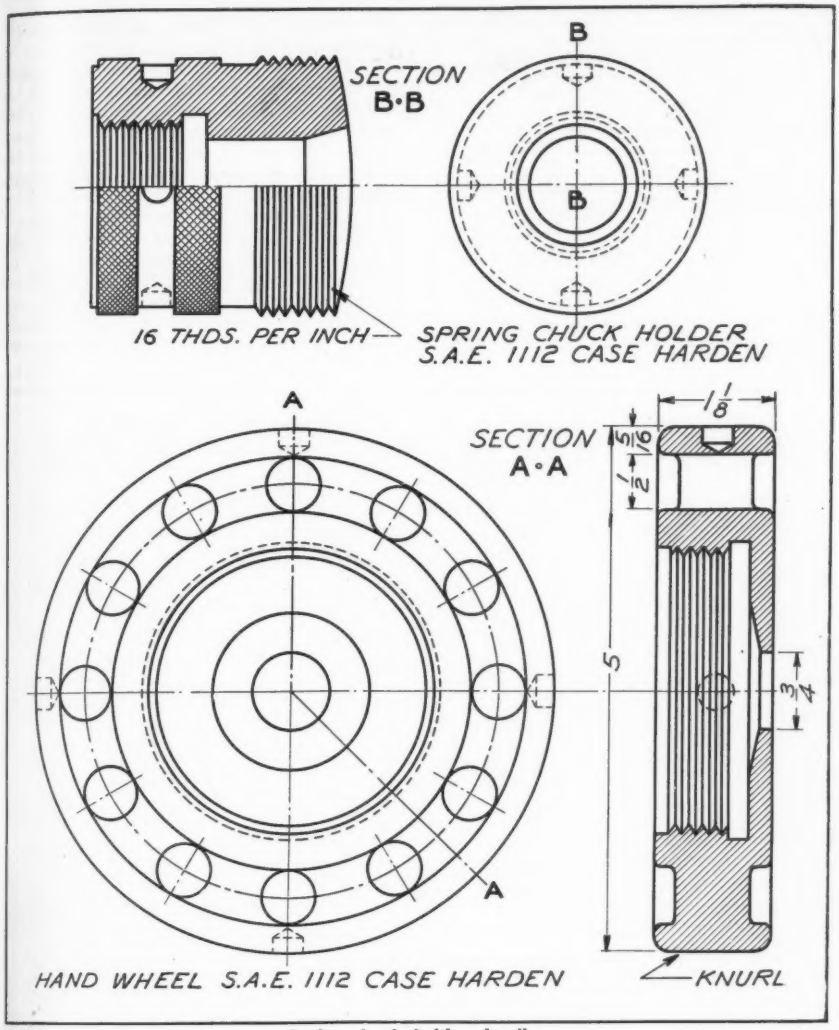


Spring-chuck holder

The writer has experienced considerable difficulty with damaged drawback threads. Practically everyone in the shop has been stripped at one time or another. Repairs were made so that the tubes could be placed back in service, but the recurrence of the troubles necessitated a permanent solution. The accompanying illustrations show the result.

The spring-chuck holder was first threaded to fit the spindle nose of the lathe. It was then turned while held on the spindle nose. The outer end of the through hole must be tapered to fit the angle of the spring-chuck head. The chuck is slipped into the tapered seat hole and projects about ⅛ in. beyond the front of the holder. Four 5/16 in. holes are drilled in the body so that a pin or spanner wrench may be used to tighten or loosen the holder on the spindle.

The larger diameter piece (handwheel) was faced off in a four-jawed chuck, drilled



Spring-chuck holder details

with a small hole through the center and then the large diameter recess was bored and threaded to fit the external thread on the adapter. While in the chuck for the turning and threading, the center of the recess was bored on an agle to fit the nose of the spring chucks. The angles should be measured directly from a chuck. The cutout portion of the handwheel, outside the threaded hole, should be finished at the same setting as it would otherwise be awkward to reach while assembled. The handwheel is screwed on to the holder for finishing. The holder is, of course, held by the spindle thread to which it is fitted. The small hole is enlarged to about half the outside diameter of the spring-chuck nose. The outside face of the handwheel is at a slight angle. The holes which are drilled in the cutout section are to remove weight and to add to appearance. The top edges are slightly rounded and a raised knurl is made to add to the appearance and ease of operation. Several holes are drilled in the rim so that a pin or spanner wrench may be used if needed.

Before being placed in service the holders must be hardened. We hardened ours with a patent carburizing compound. There is no sign of failure in any of the holders although they have been in use for some time now. No key is necessary in the adapter as the wheel exerts a practically straight push back causing the chuck to close with no apparent tendency to turn. The holders are as effective as the regulation drawback type and are much more sturdy.

USEFUL LABORATORY SWITCHBOARD

W. H. Creighton,
Washington Junior High School,
Cincinnati, Ohio

Wherever the fundamentals of electricity are taught there is need for a means of quickly obtaining a supply of direct and alternating current at different voltages.

In a physics laboratory or a high-school electric shop where experiments are carried out by the class as individuals, much expense and damage to apparatus can be avoided by the simple expedient of limiting the kind of current and the voltage available on the tables or workbenches.

Some time ago, such a need was felt in the Cincinnati public schools and a survey was made of the switchboards then available. These were found to be quite expensive and not entirely suitable to our needs. There seemed to be a universal practice of obtaining the desired results by the use of two plugs or prods connected by a long flexible cord or wire which were inserted in receptacles mounted on the board.

When several circuits were being used the board looked like a telephone operator's idea of a busy day. The wires crisscrossing and sometimes being pulled out by mistake when changes in the combinations became necessary.

As a result of this survey it was suggested that a board be designed which would suit our needs.

No switchboard of this type can be a stock article. Each installation is an individual problem and must be so treated.

Since that time we have constructed six switchboards that are now in service in our schools. These boards were constructed as class projects, electrical and mechanical details being worked out in class.

The purpose of this article is to describe the latest board produced in our shop. Safety and simplicity of operation, along with the latest ideas in switchboard construction are embodied in the design. All equipment and fittings are standard. This effects quite a saving in cost as especially made parts are always expensive.

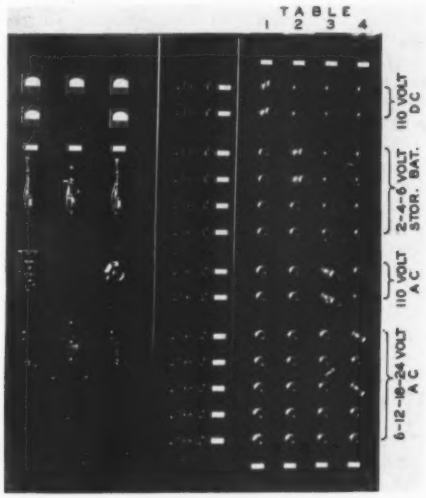


Fig. 1. Front of Switchboard

Figures 1 and 2 give some idea of the finished product which must be considered as a basic type or system that can be expanded

Fig. 2. Rear of Switchboard

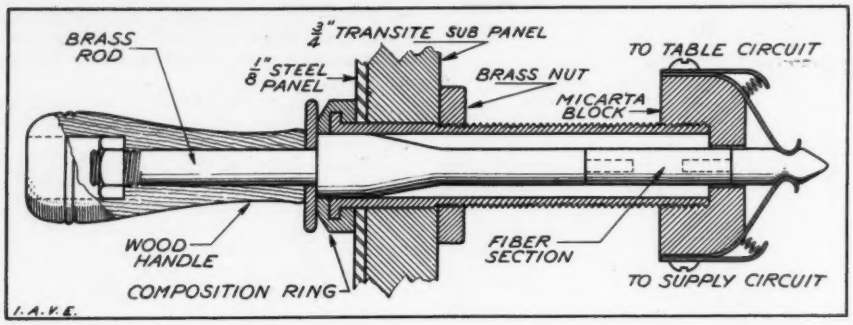


Fig. 3. Switchboard Plug

to meet any situation and for any feature of control.

This board is intended to supply four 16-ft. tables at which eight students each may be accommodated.

The panels are ⅛-in. steel, all equipment is strictly *dead front* and at no time is there a single live spot on its surface. Circuit breakers are used in all circuits so fuse troubles are entirely eliminated. The breakers protecting the various table circuits may be seen in the narrow center panel. The right-hand panel, in Figure 1, consists of four vertical rows of receptacles, each row supplying one table. From the top down, the first two are for 110 volts d.c. from a motor generator unit. The next four are for 2–4 and 6 volts from a storage battery. The next two are 110 volts a.c. and the remaining receptacles are to supply 6–12–18 and 24 volts from a transformer.

To show how the board is used, Figure 1 shows plugs inserted to supply 110 volts d.c. to table one, 2 volts storage battery on table two, 110 volts a.c. on number three, and number four table is being supplied with 12 volts from the transformer.

The plugs used consist of, first a wood handle securely fastened to a ⅜-in. brass rod having a short tapered section next to the handle, as shown in Figure 3. This taper makes it difficult to accidentally remove the plug, as a slight twist is needed to free it. The brass rod extending through the receptacle, has a 1½-in. section of fiber of the same diameter securely fastened to it and ends in a rounded spearhead that connects with contacts mounted on a Micarta block screwed to the back of the receptacle.

These contacts are supplied with springs, for tension, so good contact is assured. The receptacles are brass, with a red composition ring molded on the exposed end. On entering between the two contacts the spearhead completes the circuit from the source of supply to the table. Inserting the plugs in the wrong receptacles will merely cause the breakers to open.

From the description it may be seen that no current can pass beyond the fiber section in the rod and therefore both the receptacle and the rod and handle extending beyond the front of the board are at all times dead, the brass rod being broken by the insulating section.

The final panel to be described, consists of a voltmeter and ammeter for the motor generator, a voltmeter and a zero-center ammeter for the storage battery, and an a.c. ammeter. The battery ammeter is zero center so both charge and discharge rate may be read. The a.c. ammeter is connected to a double-pole double-throw transfer switch and to two single-pole short-circuiting switches so it can be connected in either leg of a three-wire 110–220-volt system and readings taken without disturbing the load.

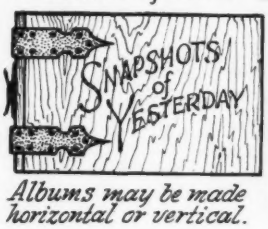
The push button controls a magnetic switch for starting the motor generator and the round handle is the field rheostat control. The main a.c. circuit breaker is in the center at the bottom of the panel and the two smaller breakers are for the motor on the motor generator set and for a circuit to supply a grinder, drill press, and a lathe.

Figure 2 shows the back of the board giving an idea of the connections and the arrangement of parts. The terminal boards for all external connections can be seen across the top. These extend back from the board about 10 in. and are supported on metal brackets.

PHOTO ALBUM OR SCRAP BOOK

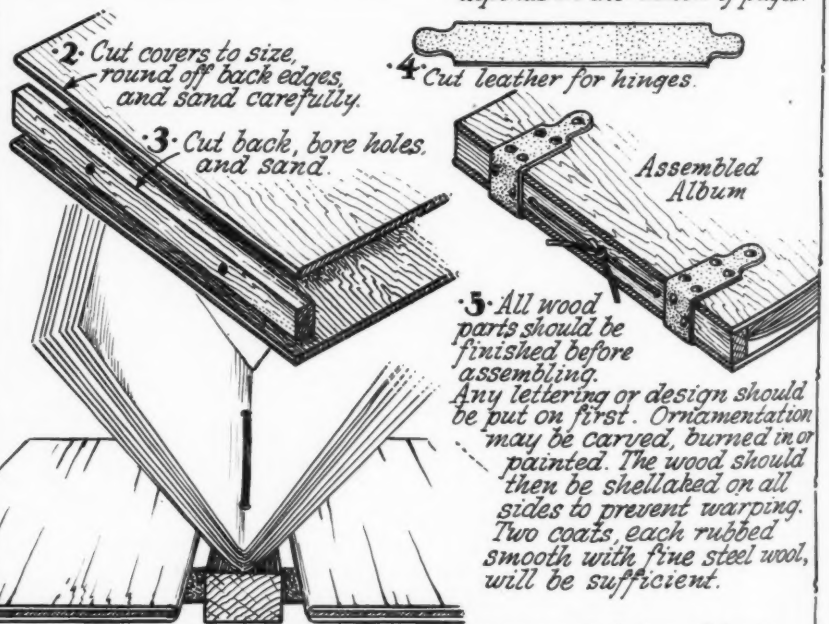
PLATE BY W. BEN. HUNT - - -HALES CORNERS, WIS.

Photographs and clippings that are not properly taken care of are soon lost or damaged. The safest place for them is in some sort of book or album. Here are shown several easily made albums that are inexpensive as well as attractive. Use ¼ inch plywood for the covers and any soft wood for the backs. Use dry leather (not oily) for the hinges and thongs. The paper should be rather heavy & can be obtained from paper houses or stationery stores. Gray or brown paper looks well in these covers.



Albums may be made horizontal or vertical.

·1· *The paper should be obtained first. Fold and cut it to the best advantage. Then figure the size of the covers. They should extend ¼ inch at top and bottom and at the outer edge. Also allow for the back. The width of the back also depends on the number of pages.*


·2· Cut covers to size, round off back edges, and sand carefully.
·3· Cut back, bore holes, and sand.
·4· Cut leather for hinges.
Assembled Album

·5· *All wood parts should be finished before assembling. Any lettering or design should be put on first. Ornamentation may be carved, burned in or painted. The wood should then be shellaked on all sides to prevent warping. Two coats, each rubbed smooth with fine steel wool, will be sufficient.*

·6· *The hinges are then fastened with short upholsterers' tacks. If tacks are too long, cut them off first, or drive them thru, cut off surplus, and hammer down. Fit hinges when album is closed.*

·7· *The pages are fastened or rather tied with a leather thong thru holes at fold of paper and back piece, and tied as shown. Good leather shoe laces are excellent for this job, but be sure they are not the oiled kind, as they will soil the paper.*

A heavy copper ground bus is bolted across the bottom of all three panels to ground the entire board and further increases safety. Every item and method is strictly in accordance with the requirements of the National Electrical Code. Nonburning insulation is used on all wires and connections are held with a washer and lock washer under the nut.

The panels are finished with a dull black switchboard lacquer and are mounted on a 2 by 6-in. channel iron.

TWO WROUGHT-IRON CANDLEHOLDERS

G. W. Talbot, Melrose, Massachusetts

Every instructor is faced with the problem, especially in junior-high-school shops, of developing models which the boys can complete in a reasonable time and which will prove of use and have enough artistic value to be taken home.

Not only must the foregoing points be met, but today the question of costs, both to the school and to the boy must be considered.

The writer believes that the two models presented herewith meet all the requirements, especially as to low cost and usefulness. None should cost more than 15 or 25 cents, for the materials used and the finished articles should be comparable to those sold in some gift shops at considerably higher prices.

No elaborate shop equipment is needed to make these two candleholders. A few short pieces of iron pipe. a machine vise, hack saw, center punch, light metal cutting shears, files, and a ⅛-in. drill are all that is needed. Of course, if your shop is equipped with a scroll bender, so much the better, but they are not necessary.

The band iron is cheap, costing about eight to ten cents a pound, and the pieces of copper for trays, etc., can usually be found in the scrap pile, but if no copper is available use galvanized or black iron. Candle sockets of copper or brass also may be purchased for five cents each or less, or they may be made according to the design shown.

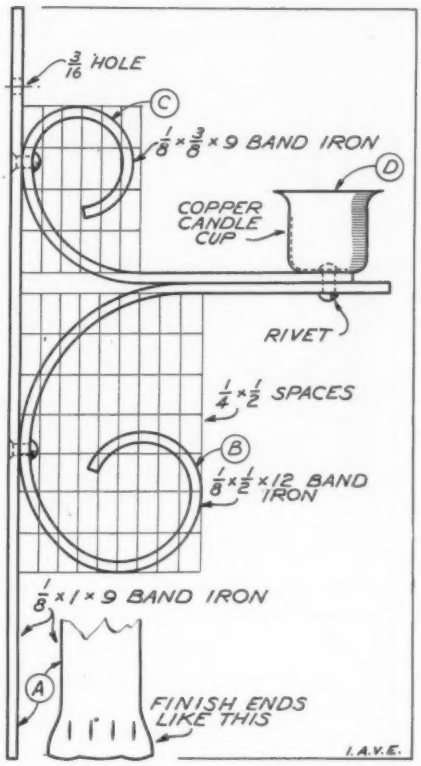


Fig. 1. Wall Candleholder

The first project may be made to utilize small pieces of iron left over from larger projects. Figures 1 and 2 show a wall candleholder which has proved to be most popular with the boys and their parents. These should be made in pairs, to be placed each side of a fireplace or mantelpiece.

Obtain a piece of strap iron about ⅛ by 1 by 9 in., the exact width and thickness being immaterial. Use whatever is found in the scrap pile.

Pound out the ends with a machinist's hammer as shown, and with a cold chisel make two or three dents as indicated. One inch from the top drill a 3/16- or ¼-in. hole for hanging. The two ⅛-in. rivet holes will be drilled later.

Next get a piece of iron ⅛ by ⅜ by 9 in. and round both ends. Form a circle about one inch in diameter by clamping the iron and a one-inch pipe in a vise and bending the iron around the pipe as far as it will go. Change the position of the iron so it is again vertical, bend once more (and a third time if necessary) until an almost complete circle is formed. One precaution must be used, on the first bend have the iron clamped on the greatest diameter of the pipe thus avoiding a flat spot in the curve.

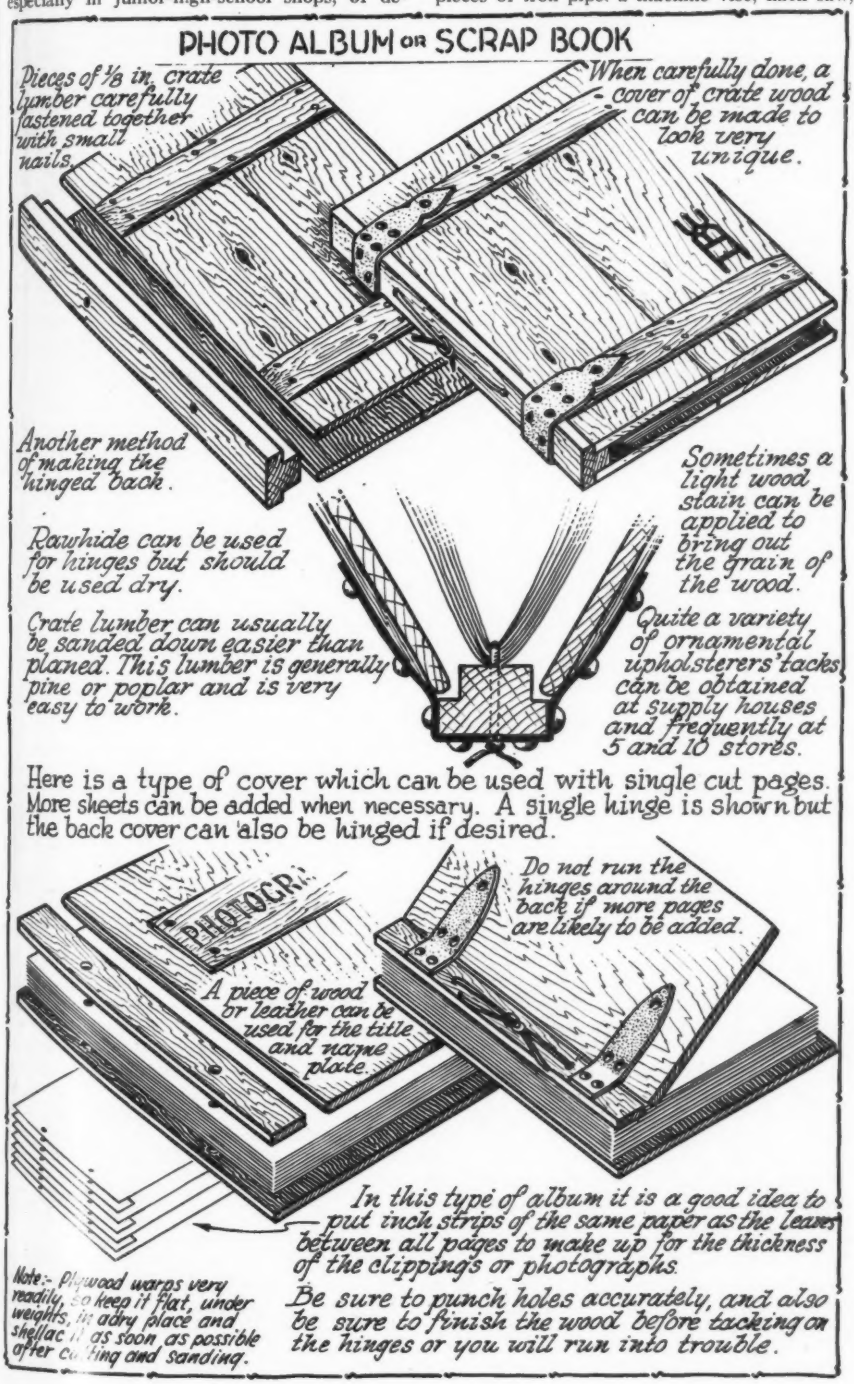


PHOTO ALBUM OR SCRAP BOOK
Pieces of ⅛ in. crate lumber carefully fastened together with small nails.
When carefully done, a cover of crate wood can be made to look very unique.
Another method of making the hinged back.
Rawhide can be used for hinges but should be used dry.
Crate lumber can usually be sanded down easier than planed. This lumber is generally pine or poplar and is very easy to work.
Sometimes a light wood stain can be applied to bring out the grain of the wood.
Quite a variety of ornamental upholsterers' tacks can be obtained at supply houses and frequently at 5 and 10 stores.
Here is a type of cover which can be used with single cut pages. More sheets can be added when necessary. A single hinge is shown but the back cover can also be hinged if desired.
PHOTOGRAPHS
Do not run the hinges around the back if more pages are likely to be added.
A piece of wood or leather can be used for the title and name plate.
In this type of album it is a good idea to put inch strips of the same paper as the leaves between all pages to make up for the thickness of the clippings or photographs.
Be sure to punch holes accurately, and also be sure to finish the wood before tacking on the hinges or you will run into trouble.
Note:- Plywood warps very readily. To keep it flat, under weights, in adry place and shellac it as soon as possible after cutting and sanding.

Complete a graceful curve as shown in the drawing by means of a scroll bending jig if one is available. A very good substitute for this jig may be made by clamping a narrow monkey wrench in a vise, leaving the jaws

Fig. 2

of the monkey wrench open to about the thickness of the metal used.

The lower scroll *B* is ⅛ by ½ by 12 in. The lower circle is made around a pipe about 1¼ to 1½ in. diameter, and the remainder of the curve made as above.

Hold the two curves together, place on back *A*, and with a square determine the correct position of the scrolls to have the bracket at right angles to the back. Mark the positions for the rivet holes on all three pieces, drill them with a ⅛-in. drill and fasten with two rivets at the back. After these are riveted, locate a satisfactory place for the candleholder, drill the rivet hole, and fasten it on.

In the drawing of the next model will be found a suggestion as to how the candleholder may be made, or, of course, it may be purchased.

The second project in the series is a *Candle Hurricane Lamp*.

This model is shown in Figures 3 and 4. While it looks somewhat difficult, it is really very simple. Many of the seventh-grade boys have made them, and were delighted to take them home.

First make the frame *A* by obtaining a piece of bend iron 1/16 by ⅜ by 24¾ in. Find the center of it, measure 2⅛ in. each side of it and bend at right angles. Along these sides measure 9½ in. and bend in, giving you a small piece about ½ in. long to rivet to the legs. Drill holes about ¼ in. from the ends of these pieces, using ⅛-in. drill.

Next cut two pieces for the feet, 1/16 by ⅜ by 7 in., and round both ends of each piece with a file. Form the feet around a pipe of ¾ in. diameter, using the pipe and vise method previously spoken of. Then drill

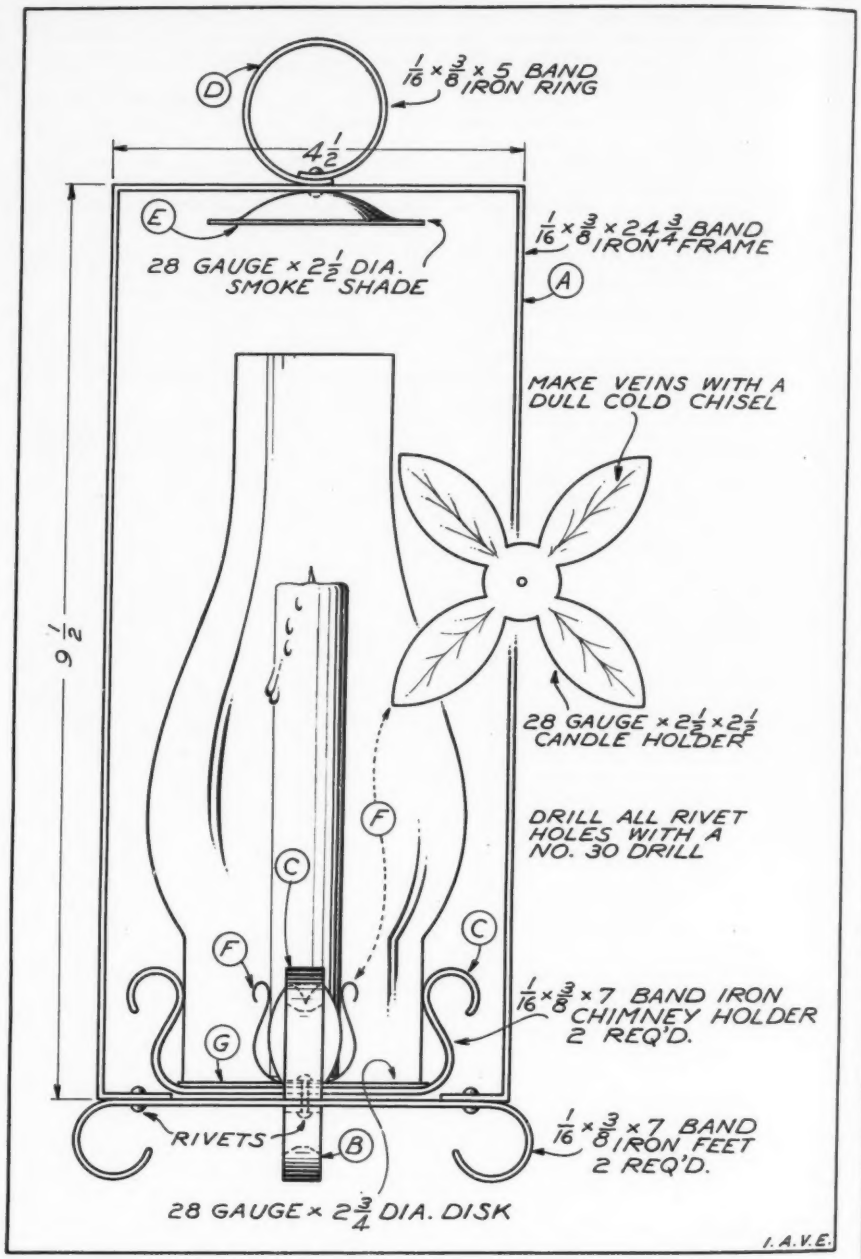

1/16 × 3/8 × 5 BAND IRON RING
D
4 1/2
E
28 GAUGE × 2 1/2 DIA. SMOKE SHADE
1/16 × 3/8 × 24 3/4 BAND IRON FRAME
A
MAKE VEINS WITH A DULL COLD CHISEL
9 1/2
28 GAUGE × 2 1/2 × 2 1/2 CANDLE HOLDER
DRILL ALL RIVET HOLES WITH A NO. 30 DRILL
F
C
C
F
G
1/16 × 3/8 × 7 BAND IRON CHIMNEY HOLDER 2 REQ'D.
RIVETS
B
1/16 × 3/8 × 7 BAND IRON FEET 2 REQ'D.
28 GAUGE × 2 3/4 DIA. DISK
I.A.V.E.

Fig. 3. Hurricane Lamp

a hole in the center of each leg, and two additional holes in one leg in order that the frame may be riveted to this leg. Be sure to check carefully the inside diameter at the top and bottom of the frame, then mark through the holes in the frame the position of the rivet holes on the leg.

The chimney holders *C* are made from two pieces of iron, 1/16 by ⅜ by 7 in. with the ends rounded. A curve is made with a ⅜-in. pipe and vise as before, on each end of each piece, then a slight inward curve is made in order that the iron holder may touch the glass chimney at one point only, as shown in Figure 3. Having completed these four curves, find the center of each piece and drill a ⅛-in. rivet hole. From the center just used, measure 1⅜ in. each side and bend at right angles.

To prevent too much draft and to offer a support for the bottom of the chimney, a circular piece of galvanized iron *G* is cut to 2¾ in. diameter, and a ⅛-in. hole is drilled in the center. Then make a candleholder from copper or iron from a square 2½ in. on a side, drawing diagonals and sketching in a petal form, similar to the one shown at *F* in Figure 3. The circle in the center is ¾ in. diameter. This fits most candles. A spun candleholder may be used, and this does save some fussy work. They can be obtained for about five cents each.

All that remains is to make a small ring of 1/16 by ⅜ by 5-in. iron 5 in. for the top, and a smoke shade of copper or iron.

The ends of the ring should be filed slightly to make a neater lap joint, the piece rounded on a 1⅜-in. pipe, and ⅛-in. holes drilled ¼ in. from the end. The smoke shade is made from a piece of copper, preferably, but iron will do. This should be 2⅛ in. diameter

with the center indented a quarter of an inch deep to a 1½ in. diameter. A block of wood with a 1½ in. concavity, ¼ in. deep plus the round end of a machine hammer will do this trick of dishing quickly.

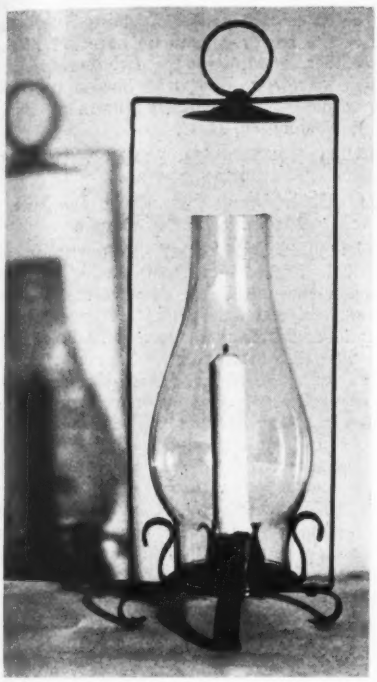


Fig. 4

To assemble, attach the ring and smoke shade to the top of the frame. Then the frame to the one leg already drilled for this. Next, taken in order from bottom up is the other leg, two shade holders, iron disk on which the chimney rests, and last of all the candle-holder.

A ½-in. piece of iron rod, or a rivet header, enables one to rivet the lower assembly with ease.

Paint all iron with flat black paint, have the copper polished and waxed, and assemble the lamp with a candle and a ten-cent lamp chimney.

AN ELECTRIC PYROGRAPH

Byron M. Taylor,
Woodrow Wilson Junior High School,
San Diego, California

The pyrograph shown in Figure 1, is designed to burn script or design into wood, leather, and a variety of other materials. The tool here described is an excellent object for a school project not only for itself but for the related information which its construction will convey to the student. He learns of electrical circuits and the energy in them. The construction illustrates the use of insulators and conductors both as to electricity and to heat. The handle is of original and practical design.

A few hand tools and materials of stock sizes and types are all that are needed. The operations requiring closest attention are: (*a*) The winding of the resistance so that the turns do not touch, and (*b*) the assembly of the heating element so that the finished bulk will admit of its insertion in the porcelain tube.

Begin with the core of the resistance coil

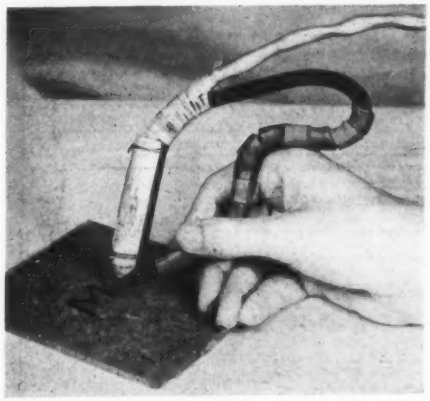


Fig. 1

which is a piece of ⅛ by 2⅞-in. round Bessemer rod. Of course, brass, copper, or bronze rod may be substituted. At one end form the working point, as shown in Figure 2. This is done by placing the piece in a vise and filing to shape. Figure 3 shows a piece of sheet mica 10 mils in thickness. Wrap this around the rod so that the edges meet as shown in Figure 4. It will be convenient to tie the mica in place temporarily with thread or string.

For the combined tie and terminal wires which are best seen in Figure 4, use No. 24 black iron wire. Twist the ends tightly with pliers leaving one end 5 in. long and cutting the other end off short. At the other end of the core proceed in the same way only have the tie diametrically opposite the first one and leave the longer end about 1½ in.

The resistor takes about 5 ft. of No. 40 nichrome resistance wire, for a 40-watt heat. This wire is very fine and takes careful handling when winding.

To make connection to the line wire terminals carefully wrap one end of the resistance wire around the twist in the black iron wire and with the pliers bend over the short end of the wire so as to firmly hold the nichrome.

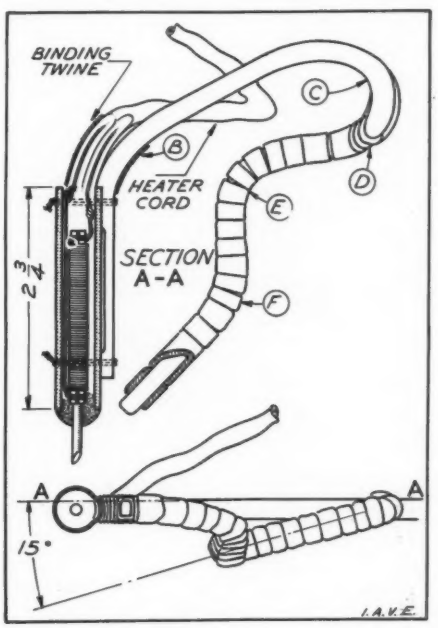


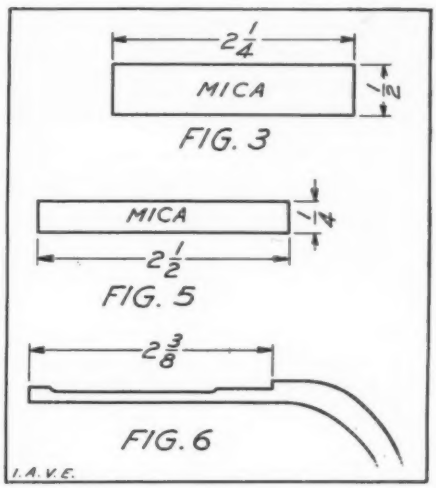
Fig. 2. Pyrograph

Pull the long end of the iron wire out of the way and wind on the resistance wire closely and firmly, leaving about 1/64 in. between turns. The resistance wire will break if anything but a light pull is put upon it.

Arriving at the other end about 56 in. of the wire should be in place. Make the attachment at this end in the same manner as was done at the first end.

The line wires can now be attached. Use No. 20 standard stranded heater cord. This connection cannot be soldered, so especial care must be taken to twist the ends of the strands and bind them with a turn of the iron wire closed with the pliers. Much care must be used here not to displace the resistance turns.

The porcelain tube, which should be a 9/16-in. outside diameter (3 in. under head) porcelain-tube insulator should be cut down to a length of 2¾ in. The portion cut off should include the head which was on the tube. File notches at the point where the cut is to be made and with the cold chisel



Pyrograph Details

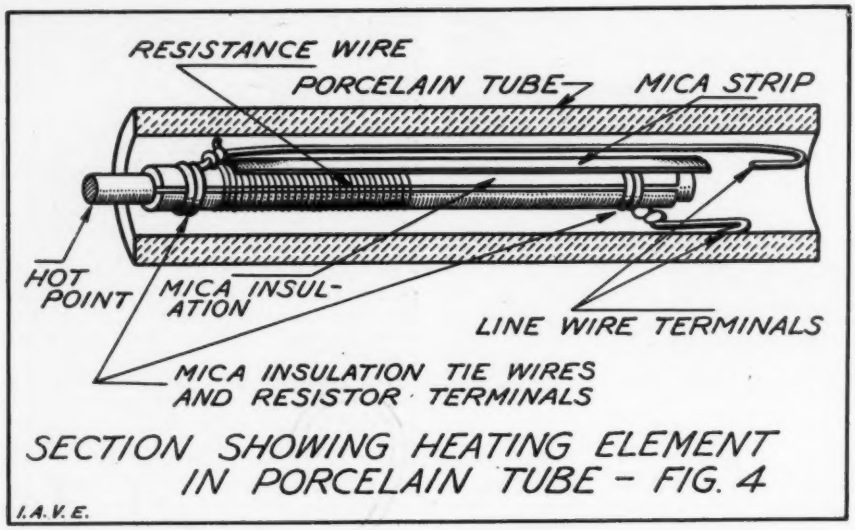
in a notch, knock off the head with a hammer. If a grinding wheel is available the end will fall off if the tube is held to the edge of the wheel at the proper point.

Slip the ¼ by 2½-in. mica strip shown in Figure 5 between the coil and the long iron lead as pictured in Figure 4. Then carefully insert the unit in the porcelain tube in about the position shown in Figure 4. This position may be held and air circulation in the tube prevented by pasting up the ends with asbestos or firebrick cement.

The holder and hand grip may now be made while this cement is setting. Take a foot of ⅜-in. square iron and take off the sharp edges with a file or grinder.

The handle is first bent to the shape shown in Figure 2 with a vise and a hammer. Make a full-size layout of Figure 1 and use it as a template while making the various bends. After the handle is shaped, place the rear part, *B* to *C*, in vise, place a wrench at *D* and twist the iron about 15 deg. as shown. Be sure that the two ends of the iron are in the same plane.

It is well to make a recess in the handle to hold the porcelain tube. This is shown in Figure 6. Split the rod longitudinally with a hack saw for about 2⅜ in. Then cut off one side. File down the central portion of the flat on which the tube will rest about 1/16



in. This to aid in the radiation of heat into the air and not into the handle.

To insulate the hand of the user against undue heat, sections of ⅜-in. diameter rubber tubing are slipped over the handle as shown in Figures 1 and 2.

The simplest way to fix the porcelain tube on the handle is to use iron-wire binding as shown in Figure 1. File small notches in the underpart of the tube rest to receive the wire binding.

Use common twine to secure the line wires to the handle so that the inevitable pull will not be upon the connections.

To operate, plug the line wires into the 110-volt light lines, and wait until the paint is hot enough to quickly char the material upon which it is proposed to work.

The pyrograph finds its widest use in the decorative field. It is particularly good for burning designs on wood and leather. Boxwood or sugar pine is good. The designs may be colored by going over them with Crayolas or water colors. A good and lasting finish may be given the finished piece by giving the whole design two or more coats of white shellac or clear lacquer. Designs may first be stenciled and then the outlines burned in.

PLEASE NOTE

For the following government bulletins: "Homes for Birds" No. 1456, Free; "Food for Well-Known Birds" No. 506, Free; "Common Useful Birds" No. 630, Free; "Common Game Birds" No. 497, Free; "Forest Trees of the Pacific Slope," $1.00, listed near the top of the center column on page 277 of the September, 1939, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, write to U. S. Department of Agriculture (Farmers' Bulletins), Washington, D. C.

SPEED REDUCER FOR A POWER FREEZER

H. C. Milnes, The Stout Institute, Menomonie, Wisconsin

The speed reducer on the power freezer shown in Figure 1 is an interesting advanced machine-shop problem. It involves the following instructional factors: A recommended r.p.m. for the freezer shaft is 70 to 75. The one-quarter horsepower A.C. motor has a speed of 1750 r.p.m. This divided by 70 equals 25. It is therefore necessary to construct a speed-reducing mechanism having a one to twenty-five ratio. The sectional view of the gear case shows a 25-tooth worm wheel and a 1/3-in. pitch single-thread worm. The flexible coupling to the motor is a rubber automobile generator coupling. The coupling to the freezer is a piece of square tubing.

The body castings of the gear case are of aluminum. The tobin bronze bushings for the worm-wheel shaft and the grease-pack ball bearings for the worm are excellent examples of press fits. The worm is turned from bar brass and runs in S.A.E. No. 30 oil.

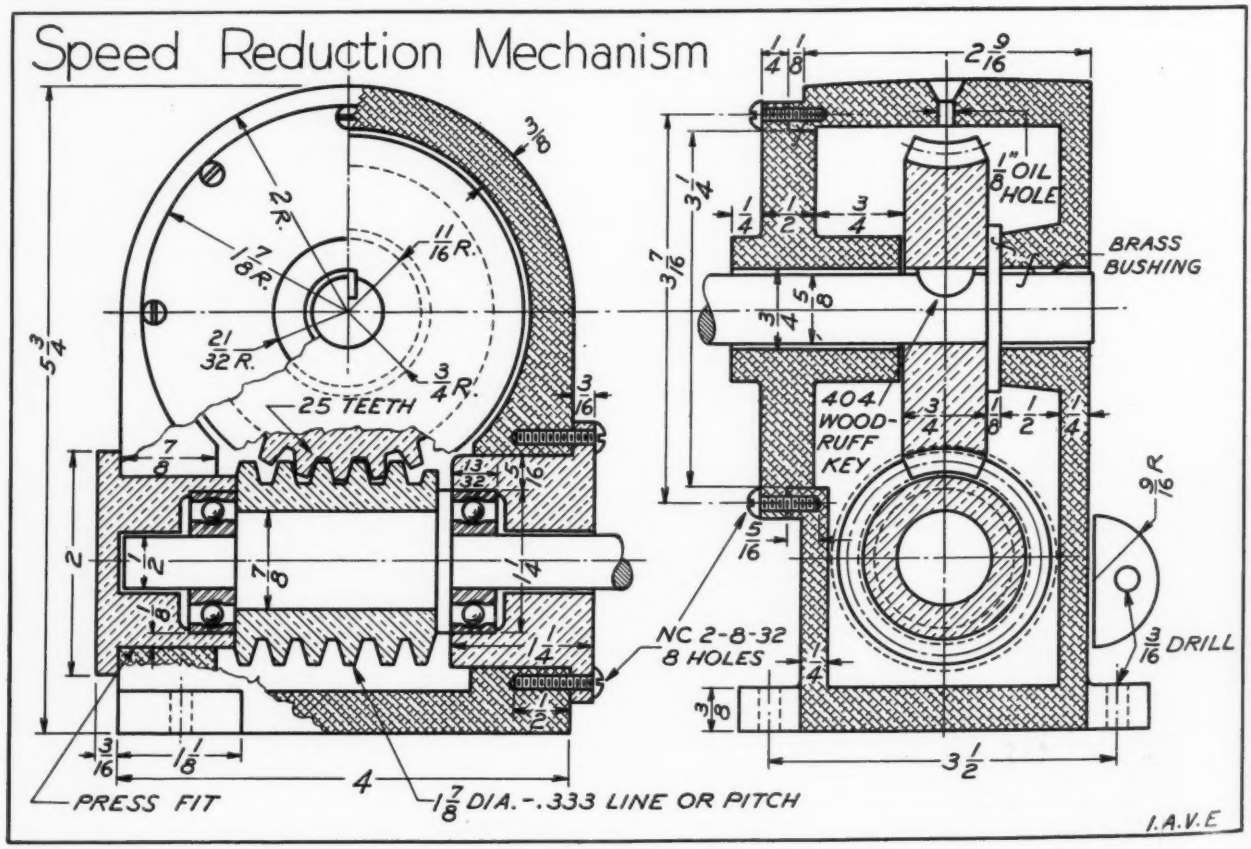
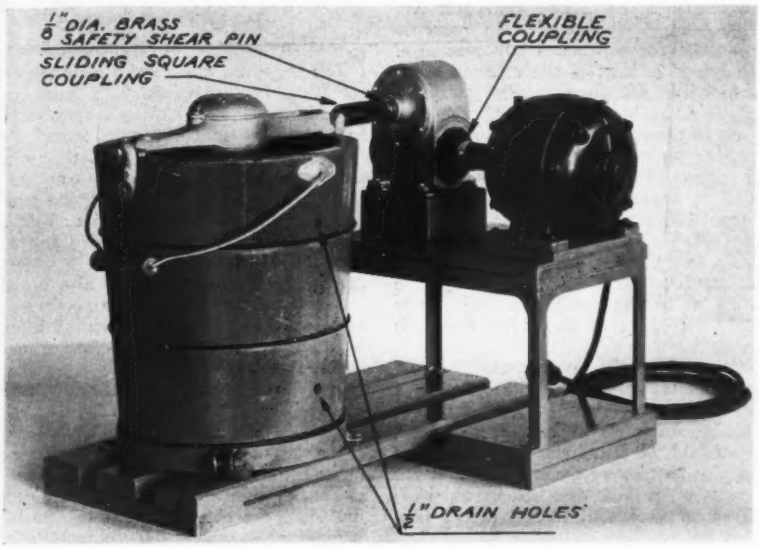


Fig. 1

The freezer used is a four-quart triple-action freezer. When ice and salt in the right proportions are fed into it, only eight minutes' time is needed to freeze the cream. While freezing the cream, the lower hole in the side of the freezer should be plugged. When packed for keeping, both holes should be open.



Speed-reducing mechanism attached to ice-cream freezer

The base clamp and the angle-iron frame are bench metal and welding jobs.

HOMEMADE SHAPER AND SPINDLE SANDER

William L. Hunter

Those schools able to afford commercially made equipment by all means should do so. However, in many places, the budget has been cut so many times during the past decade that there is no way out except to "roll your own" as far as new equipment is concerned. These illustrations and descriptive material should enable an industrial-arts teacher and his more able pupils to make, at a minimum of expense, a combined shaper and spindle sander which will do satisfactory work.

The chassis or underframe of the shaper is shown in Figure 1. It is made of 1-in. black iron pipe. Two malleable iron tees, two side outlet tees, four caps, and four floor flanges may be used. The frame also may be made of wood if one prefers. The over-all height should be from 32 to 34 in.

The motor is on a swinging mount and a coil spring keeps the V belt taut. Needless to say, the motor should be of the capacitor or repulsion-induction type and the motor bearings should be such as to permit the motor to operate in a vertical position. A one-half horsepower motor will operate the shaper for light work but a three-quarter horsepower motor will be more serviceable. The V pulleys should be such that the shaper spindle turns at least 5500 r.p.m. More speed is desirable, if it is obtainable.

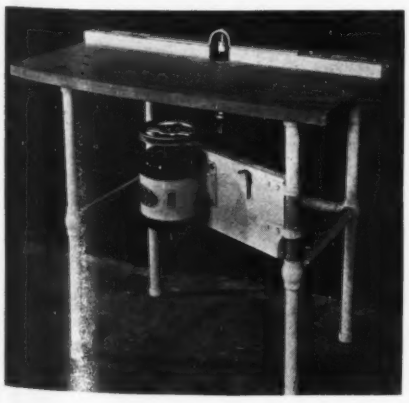


Fig. 1

Fig. 2

The head for this shaper can be removed entirely or raised up and down for vertical adjustments. The head is held in a fitting made of a standard 3-in. pipe flange and a short length of 3-in. pipe threaded at one end. As shown in Figure 2, two setscrews secure the head in the short length of pipe.

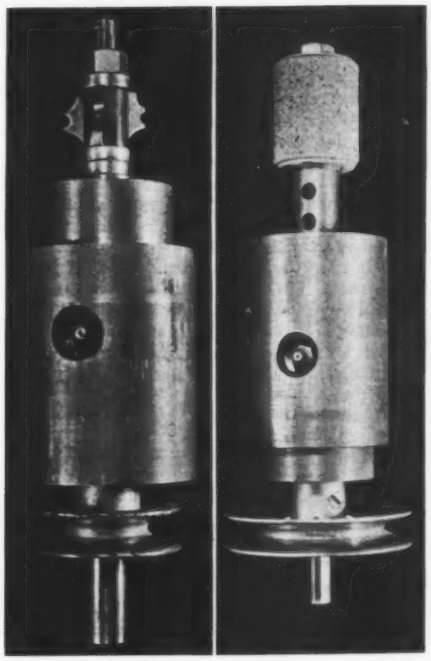


Fig. 3 *Fig. 4*

The head shown in Figure 3 is made of a piece of round mild steel. A hole 1 in. in diameter is bored through this and a bronze sleeve bearing is pressed into each end and reamed to ¾ in. A Zerk fitting is provided for greasing. A shaft is then turned, threaded, and ground to fit the bearings. The cutter end of the shaft is ½ in. in diameter. Standard ½-in. cutters and collars are available from various supply houses.

The spindle sander head (see Fig. 4) is similarly made but a piece of ½-in. drill rod can be used for the shaft and no grinding is necessary. The sander drum and sleeves also are standard products available on the market.

Either head is adjustable vertically, or one may be removed to be replaced by the other.

KEEPING THE CASES CLEAN

D. W. Conner,
Connelley Vocational High School,
Pittsburgh, Pennsylvania

One of the most perplexing problems confronting the teacher of printing is that of keeping the type cases clean. Even in some commercial plants, as well as in a large number of school composing rooms, the cases are in a deplorable condition. This, no doubt, is due to a lack of systematic methods of distribution and possibly to the fact that a considerable number of pupils, for some unknown reason, detest the distributing of type.

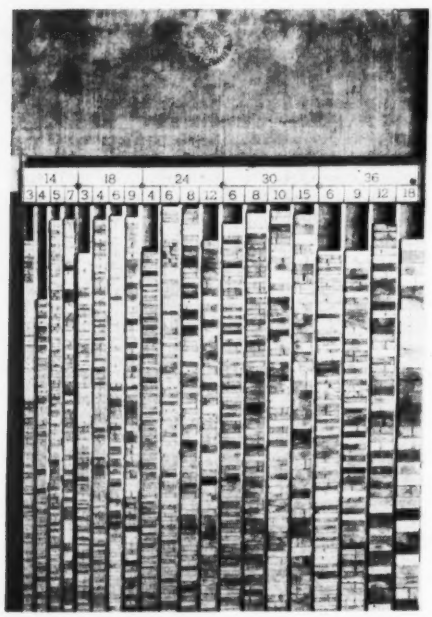
The writer in twenty years' experience in teaching printing in the public schools has tried a number of ways to overcome this distribution difficulty, and has found the following method very satisfactory in producing the desired results.

In the past, considerable distribution has been done by beginners, or by apprentices in the trade. However, it is our belief that distributing is too difficult a job for a beginner, therefore, this job has been saved for pupils who have been in the school print shop for at least a year and a half. The fourth-semester pupils are divided into five groups thus giving each group two weeks in each of the following:

1. Distribution.
2. Clean-up (if necessary), lockup, and imposition.
3. Stock clerk, recordkeeping, and straight-matter distribution for beginners.
4 and 5. Composition of jobs that are to be used by the second-semester pupils and for production.

The following describes the work of the distribution group. Two proofs are taken of each job; one with the pupil's name is given to the stock clerk who files it, while the other is marked by the pupil with the styles and sizes of type. This proof is carefully checked by the instructor before any type is distributed. All the cases in the shop are divided into five groups and daily inspection of one of these groups is made either by the instructor or some reliable, advanced pupil. Those cases that need to be cleaned are brought to the attention of the distribution group provided they have done the distributing, or to the attention of the clean-up group if the distribution group has been shifted to the clean-up group which is the sequential order of shifting these groups.

In many cases of type, there has been a tendency to use the space and quad boxes for a dumping place for all sizes of spaces, and in some instances type has been dumped in these boxes. It was decided to place boxes of different sizes of spaces and quads on top of the cabinets to be easily accessible to the compositors, thereby conserving the amount of spacing materials carried in all the various cases. In a short time this proved to be even



Galley on which 14, 18, 24, 30, and 36 points; 3, 4, and 5 em spaces and en quads are kept

worse than carrying the spaces and quads in the regular places in the cases, for these auxiliary boxes became so badly mixed that they had to be sorted each day to get the right size of space needed. In short, it didn't work. While one group would keep these boxes clean religiously, some member of another group would come along and dump a handful of various sizes of spaces on top of the previously cleaned spaces, believing as a great many do in "letting George do it."

A regular 9 by 13-in. galley was used in which low slugs were placed to divide the various sizes of spaces and quads. At first only the 5-em and 4-em spaces and end quads of 14, 18, 24, 30, and 36 point were placed in this galley which is kept standing on top of the cabinet resting in an inclined position, but this proved to be so handy that the 3-em spaces were also added. Above the spaces and quads the point thickness of each space is shown for the compositor's ready reference.

The only spaces kept in the cases now are the overflow that will not fit on the galley. It is more desirable, however, to keep the surplus spaces in the stock room. Em quads, 2-em quads, and 3-em quads are kept in the cases in their regular places and lead spaces in the various sizes are available and can be obtained from the stock clerk as needed. It is the duty of the stock clerk to keep this galley completely filled with the various sizes of spaces and quads. Those distributing type must turn in to the stock clerk all spaces completely sorted as to size, after each job is distributed.

In order to help the pupil mark his proof with the various sizes and styles of type, a style sheet is provided which contains lines of each size and style of type in the shop.

This method of handling the distribution problem, the keeping of clean cases, and the handy way of making the spaces available has proved so successful that it merits consideration and trial.

SHOP DRAWING BOARD

J. Henry Schroeder,
Southern Illinois State Teachers College,
Carbondale, Illinois

The need for a convenient and accessible place for students to draw plans while working on a project has been felt by many shop teachers. With increased enrollments, room is at a premium and teachers may welcome the device described herewith. Since we do not have rooms enough to provide a separate drawing room, and since our shop is not large enough to have one end used as a drawing room, we constructed a drawing board for each workbench. This board is held in either of the two vises of the workbench, and the student sits upon a laboratory stool while he draws. When the benches are used for shop-work, the drawing boards are hung under the projecting end of the bench top, completely out of the way.

HOW TO CLEAN AND CARE FOR PAINT BRUSHES

Frank Brokesh, Winfield, Iowa

The very best and careful shop teacher will get paint brushes caked with paint and oil. Here is a way to clean, put away, and care for paint brushes. I have tried it and it works.

First wash the brush in gasoline or kerosene, cleaning sides badly caked with an old plane iron. Work the paint out of the brush. If some bristles are badly caked or bent at the tip, place the brush on a board and cut the ends off with the plane iron. Some caked bristles along the sides may also be cut off.

Next wash the brushes in a good mechanic's soap, using but little water except afterwards to wash out the soap. Some brushes may take several washings before the paint has been thoroughly removed from the bristles.

Third, bore holes in each brush just above the tin. These holes should be large enough for a No. 6 to 12 wire. String the brushes on this wire.

Fourth, hang in a pail, so that brushes do not touch the bottom. Put in enough lubricating oil, about grade ten, to reach almost to the top of the bristles. This oil will not dry out or harden.

Before using the brushes in paint, enamel, or varnish, brush out the lubricating oil on an old board or on a piece of cardboard, or some paper, and wash the brush in turpentine.

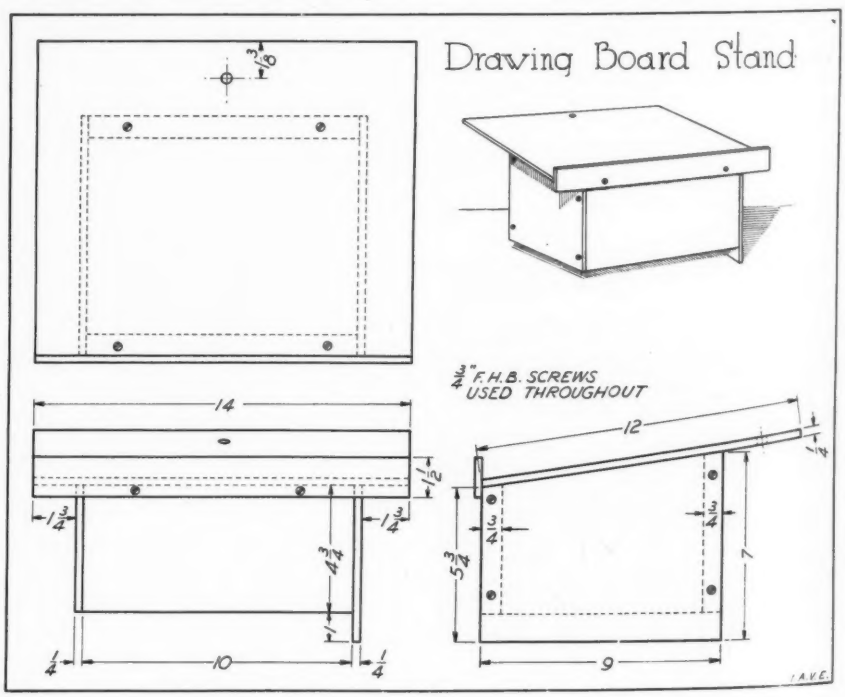
In this way paint and varnish brushes may be cleaned that many teachers would throw away.

DESK LIGHT

Robert E. Murray,
Fremont Ross High School,
Fremont, Ohio

A very serviceable desk light can be made from a discarded automobile hub and an

(Continued on page 348)



DESK LAMP
I.A.V.E.
ARM
SECTION A-A
NOTE: THE MAJORITY OF ELECTRIC STOVE LAMPS ARE PRACTICALLY THE SAME, NO DETAILS ARE GIVEN
DRILL, 2 - 9/64 HOLES DIAGONALLY THROUGH UPPER PART OF ARM FOR 1/8 × 5/8 40 NC ROUND HEAD MACH. SCREWS. HEXAGON NUTS ARE TO BE CONCEALED BETWEEN CHANNELS
THUMB NUT AND ROUND HEAD MACH. SCREW HOLD CHANNELS TOGETHER
SHAFT & WASHER
1/4 × 4 - 20 NC STOVE BOLT WITH THUMB NUT
9/64 DRILL
17/64 DRILL
CONE WASHER TO BE USED ON SHAFT
METHOD USED IN MOUNTING ARM TO BASE
THUMB NUT USED TO FACILITATE LAMP ARM ADJUSTMENT
KEYWAY USED FOR ELECTRIC CORD OUTLET
1/8 × 5/8 - 40 NC ROUND HEAD MACH. SCREWS. HEXAGON NUTS ARE CONCEALED BETWEEN CHANNELS
BASE MADE FROM BUICK AUTOMOBILE HUB
THIS DOTTED PORTION REPRESENTS ORIGINAL IMPRESSIONS ON CASTING
DRILL AND TAP FOR HARD RUBBER ELECTRIC CORD INSULATOR
KEYWAY USED FOR ELECTRIC CORD OUTLET
1/4 × 4 - 20 NC STOVE BOLT USED FOR SHAFT
THUMB NUT AND ROUND HEAD MACH. SCREW HOLD CHANNELS TOGETHER
1/8 × 5/8 - 40 NC ROUND HEAD MACH. SCREWS. HEXAGON NUTS ARE CONCEALED BETWEEN CHANNELS
CONE WASHER
THUMB NUT USED TO FACILITATE LAMP ARM ADJUSTMENT
SWIVEL JOINTS
SWITCH
YOKE
BASE
HARD RUBBER ELECTRIC CORD INSULATORS
DRILL 1/4 AND COUNTERSINK TO CONFORM WITH TAPERED HEAD ON SHAFT
DRILL 1/4 AND COUNTERSINK TO CONFORM WITH CONE WASHERS
DRILL 5/8 AND TAP FOR HARD RUBBER ELECTRIC CORD INSULATOR
YOKE

electric stove light. These fixtures are easily obtainable from any electrical-appliance or secondhand store. Not much skill is required to turn up the base and to shape the lamp support according to dimensions given in the illustration on page 347. After the parts are machined, they can be assembled by pressing the support into the base. No material is removed from the interior of the base because the weight might be needed to keep the lamp from becoming overbalanced when the arm is extended in a horizontal position.

Through the alemite hole in the hub, a rubber-insulated bushing is inserted and the cord passed through it to prevent any electrical shortage in the base.

After finishing the unit, it may be chromium plated.

The photographs give a clear conception of how the lamp may be used on either a roll- or a flat-top desk.

Personal News

Dr. T. A. Hippaka Goes to Iowa State College

Dr. T. A. Hippaka, formerly Director of Industrial Education at Madison, Wis., has been appointed to the position of Professor of Industrial Education at Iowa State College, Ames, Iowa.

After graduating from The Stout Institute, Menomonie, Wis., Dr. Hippaka attended the University of Wisconsin where he earned the B.S., M.S., and Ph.D. degrees.

Dr. T. A. Hippaka

He held the position of Director of Industrial Education at Fond du Lac, Wis., from 1916 to 1918. The next two years were spent with the United States Navy. From 1919 to 1921, he again held the position of Director of Industrial Education at Fond du Lac, Wis. In 1921 he was appointed Director of Industrial Education, Madison, Wis., which position he held until his recent appointment to Ames, Iowa.

He has held the presidency of the following organizations: Madison Teachers Association, Southern Wisconsin Teachers Association, and Wisconsin Industrial Arts Association. He also was treasurer of the Wisconsin State Teachers Credit Union, and is at present a member of the Executive Committee of the Wisconsin Industrial Arts Association. Dr. Hippaka holds membership in the N.E.A., Phi Delta Kappa, Wisconsin Industrial Arts Association, Wisconsin Vocational Guidance Association, and Wisconsin Teachers Association.

The best wishes of a host of his Wisconsin friends go with him into his new field of endeavor.

♦ Robert M. Whiting, formerly of the Burdick Junior High School, Stamford, Conn., has been appointed to the faculty of the New Bedford High School, New Bedford, Mass. Mr. Whiting is Arts Director at Camp Winona, Denmark, Maine, during the summer.

♦ Cecil Wriedt has been appointed head of the industrial-arts department of the high school at Cedar Falls, Iowa.

♦ Charles A. Burnes, who formerly taught industrial-arts work at Beckley, W. Va., has been appointed to a similar position at Gibsonville, N. C.

♦ Dr. Lawrence F. Ashley of Yonkers, N. Y., was a guest professor at Iowa State College, Ames, Iowa, during the summer session which has just closed.

♦ O. P. Badger of Tulsa, Okla., was a guest professor at Iowa State College, Ames, Iowa, during the past summer session.

♦ Victor M. Brooks has been appointed to teach industrial arts at the Cecil Township High School, Canonsburg, Pa.

♦ George L. Simnicht, who was formerly teaching industrial-arts work at the High School in Elk River, Minn., has been elected to fill a similar position at Luverne, Minn.

♦ Milton Berlanstein has been appointed shop supervisor at the National Youth Administration Work Center, in Niagara Falls, N. Y.

♦ William J. Becker, metal-shop instructor at the Boynton Junior High School, Ithaca, N. Y., has been instructor of the general shop during the summer sessions at Cornell University for the past four years.

♦ Edward C. Estabrooke has been appointed vocational co-ordinator of the newly organized program of vocational-industrial education in Bradford, Pa.

Mr. Estabrooke received a doctor's degree in education from the Pennsylvania State College, in June, 1939.

♦ Franklin H. Gottshall, formerly of Scotch Plains, N. J., has been appointed director of industrial arts at the Martha Berry College, Mt. Berry, Ga.

♦ Roman M. Hammes, who has been in charge of the industrial-arts program in the Abraham Lincoln High School at Council Bluffs, Iowa, has been placed in charge of the industrial-arts drawing work at Davenport, Iowa. Mr. Hammes obtained his bachelor of science degree from the Stout Institute in 1932, his master of science degree from Iowa State College at Ames in 1935, and is now at work on his doctorate at the Ohio State University, Columbus.

♦ Tilman M. Lockard, who has been in charge of the industrial-arts program in the Community High School at Dupo, Ill., will succeed Mr. Hammes at Council Bluffs. Mr. Lockard obtained his bachelor of science degree in the State Teachers College at Charleston, Ill., in 1936 and his master of arts degree from the Ohio State University, Columbus, the past summer. The subject of Mr. Lockard's thesis will be of considerable interest to the readers of this magazine. It concerns: "Calvin Milton Woodward: A Biography, with Special Reference to His Pioneering Efforts on Behalf of Manual Training," and is an unusually complete and well-illustrated document.

♦ Chester A. Lyle, formerly instructor of printing at the McKinley High School, Canton, Ohio, has been appointed to assume a similar position at the Timken Vocational High School, Canton, Ohio. In his new position he will establish the first vocational course in printing to be offered in Canton.

♦ Clyde A. Bowman, Dean of the Division of Industrial Education, The Stout Institute, Menomonie, Wis., spent two weeks at the Arizona State Teachers College, Flagstaff, Ariz., giving short unit courses in graphic analysis and organization of instructional material.

♦ The Manual Arts Press, Peoria, Ill., announces the election of Laurens L. Simpson as its president, to succeed Charles A. Bennett who now becomes chairman of its Board of Directors. Mr. Simpson has been with the corporation since 1910 and for most of that time has been its treasurer and business manager.

New Publications

A Working Vocabulary for the Carpenter

By Arthur C. Morgan. Paper, 67 pages, 4½ by 7. Price, 50 cents. Printed by San Jose Technical High School Print Shop, San Jose, Calif.

This handy little booklet contains over 1,200 words and definitions that are used in carpentry and the allied trades. It is excellent related material for any student of woodworking, especially those who are interested in learning any of the woodworking trades.

Applied Mathematics

By James F. Johnson. Cloth, 434 pages, 5⅝ by 8⅜, illustrated. Price, $1.40. Published by The Bruce Publishing Co., Milwaukee, Wis.

An exceptionally well-arranged text to give students in junior high, senior high, part-time and full-time vocational schools, and trade apprentices a thorough understanding of the practical application of elementary mathematics to the everyday problems met in business, industry, and in the trades.

These applications are shown in common fractions, decimal fractions, money, percentages, linear measure, board measure, square and cubic measure, and shop formulas. A number of useful tables have been appended.

The model solutions and the explanations are plain and understandable. The book is well illustrated and possesses real boy appeal.

The New Archery

By Paul H. Gordon. Cloth, 423 pages, 5⅝ by 8¼, illustrated. Price, $3.50. Published by D. Appleton-Century Co., New York City.

A book in which archery as a hobby, a sport, and a craft is comprehensively treated.

The book is divided in four parts. In the first of these, the history of archery is treated in an interesting manner. Part Two describes the various types of shoots and games to which archery can be adapted. Part Three describes the making of bows, arrows, strings, and other equipment needed by the archer. Part Four describes how archery may be introduced as an activity for summer camps and school clubs.

An extensive bibliography and a glossary are appended.

Pewter — Spun, Wrought and Cast

By B. N. Osburn and G. O. Wilber. Cloth, 151 pages, 7⅞ by 10¾, illustrated. Price, $2.50. Published by International Textbook Co., Scranton, Pa.

This excellently illustrated book on pewter work contains explicit directions for the student and craftsman which will make it quite simple for him to make excellent reproductions of the many historic and modern pieces shown.

Typographer's Desk Manual

By Eugene De Lopatecki. Cloth, 87 pages, 9¼ by 12¼. Price, $3.50. Published by The Ronald Press Co., New York City.

A book that is designed to be a real help to the man who has to design in type. In it, the author offers the material offered to the printer by the type founders in such a way that design problems may be more easily solved.

The visual size of the various faces of type, their basic design, weight, and legibility, are all discussed and presented for easy visualization and quick reference.

Arc Welding in Design, Manufacture and Construction

Published by the James F. Lincoln Arc Welding Foundation, Cleveland, Ohio. Paper, 1,408 pages, 6 by 8⅞, illustrated. Price, $1.50.

One hundred and twenty-five experts in their fields combined their efforts to produce this stupendous encyclopedic volume on the welder's art.

The material is divided into ten sections in which are covered the applications of arc welding in the fields of the automobile, aircraft, railroad, watercraft, structural, furniture and fixtures, commercial welding, containers, machinery, and jigs and fixtures.

All sections of the book are well illustrated and there are numerous tables on scientific, factual, and cost data.

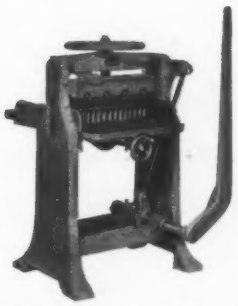
School Printshop

LAYOUTS EQUIPMENT SUPPLIES

by ATF

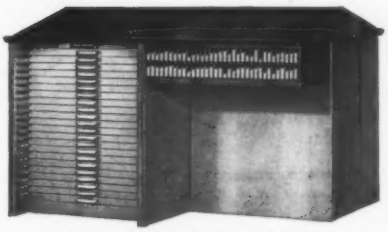
ATF Education Service has devoted 45 years to the development of school printing departments . . . and maintains an experienced staff of engineers to help you plan your department. They will furnish, without cost, layouts for the ideal school printshop . . . advise you in the selection of units best suited to your needs . . . or help you solve any problems in the layout or organization of your school printing department. Don't hesitate to avail yourself of this service. There is absolutely no cost or obligation.

School Pressroom Cabinet



C & P Buckeye Lever Paper Cutter

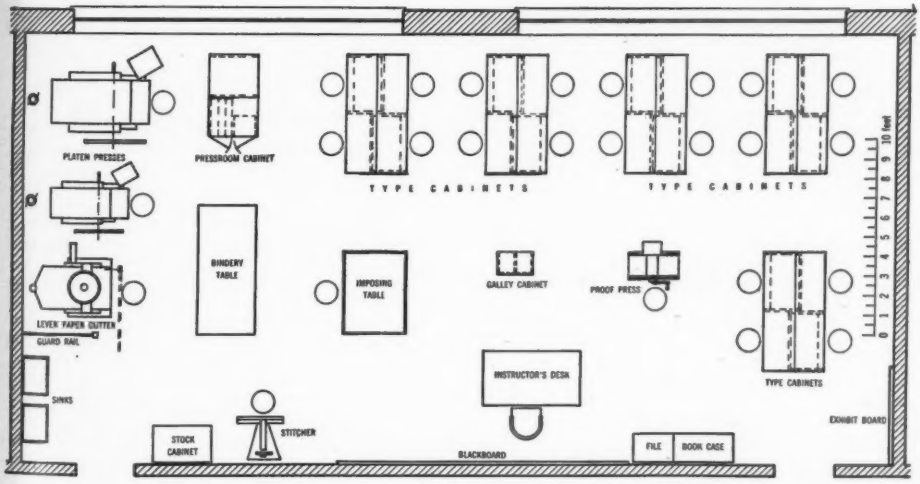
C & P Platen Press



Standard School Type Cabinet

No. 1 Vandercook Proof Press

These are only a few pieces in the large assortment of school printshop equipment we carry. Complete listing upon request.



The ideal layout for a Senior High School printing unit to accommodate 20-23 students. Approximate room size, 22x45 feet. This is only one of the many School Printshop layouts ATF is prepared to furnish.

"Why Teach Printing?" Valuable information for anybody interested in teaching this worthwhile subject. Send for your copy today, it's free

American Type A century of experience, plus the finest materials and workmanship, are united in the manufacture of American Type. The Handy Index of American types easily and quickly familiarizes even the beginner with the modern, as well as time-tested faces. A copy will be sent free upon request.

American Type Founders

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A "Boy Proof" HAMMER for Every School Shop

STANLEY
TRADE MARK

Nail Hammer

Nail Hammer

Tinner's Riveting Hammer

Tinner's Setting Hammer

Machinist's Ball Pein Hammer

Whatever the shop — woodworking, plumbing, farm, forge, bricklaying, electrical, automotive, aircraft and metal — its needs are met by Stanley — the most complete hammer line available.

Heads are tempered by an exclusive process which strengthens the grain structure of the steel to its full potential. The straight grain hickory handles are oil treated, to prevent shrinkage and assure tight heads. These and other features equip Stanley Hammers for hard usage in school shops.

Catalog 34 gives full details on these and other Stanley Tools for school use.

STANLEY TOOLS
Div. of The Stanley Works
Educational Dept.
New Britain, Conn.

Blacksmith's Hand Hammer

Machinist's Riveting Hammer

Trimmer's Tack Hammer

Auto Body and Fender Bumping Hammer

Bricklayer's Hammer

News Notes

♦ The summer session at The Stout Institute, Menomonie, Wis., was attended this year by students from thirty-three states, the District of Columbia, Alaska, three Canadian provinces, Puerto Rico, and Hawaii.

♦ More than four thousand WPA supervisory employees in New York City have completed an advanced five months' course in foremanship training and have received certificates.

This work was carried on by 42 conference leaders. Each conference group consisted of 20 to 25 men, and the classes met for an hour and a half each week.

♦ A report issued by the New Jersey State WPA office records the fact that 16 New Jersey men are studying housecleaning, cooking, and serving.

Some of these men find it necessary to acquire this type of training because they cannot find employment while their wives have obtained jobs. Others have in this manner prepared themselves as housemen, and as part-time and full-time waiters.

♦ The Batavia Metal Trades Vocational School of Batavia, N. Y., was opened for public inspection on Feb. 21, 1939. The school was in process of development for over a period of three years.

♦ A new Vocational High School with its equipment has been made possible for the city of Canton, Ohio, by the civic-mindedness of H. H. Timken of the Timken Roller Bearing Co. The total value of building and equipment will exceed $1,500,000.

♦ Diversified occupation classes have been functioning in the public schools of Chester. S. Car., for the past three years. Students attending these classes work in stores, offices, cotton mills, and garages, receiving credit for this work toward their high-school diploma. Most of those who have taken this work have been permanently employed.

♦ United States civil service examinations to fill the positions of psychologist at $3,800 a year, associate psychologist at $3,200 a year, and assistant psychologist at $2,600 a year, will be held shortly.

Applications must be on file with the United States Civil Service Commission at Washington, D. C., not later than Sept. 18, 1939.

♦ The summer enrollment at Iowa State College, Ames, Iowa, has far surpassed expectations. Ten degrees were granted for the two sessions.

Dr. Lawrence F. Ashley of Yonkers, N. Y., and Professor O. B. Badger of Tulsa, Okla., were the guest professors. Professor Earl S. Baird assisted with the summer-school work and Professor H. L. Kooser had charge of the visual-education course.

♦ All members of the first graduating class of the new Department of Publishing and Printing of the Rochester, N. Y., Athenaeum and Mechanics Institute are secure in positions after completing the two-year curriculum.

♦ A conference has been called in Washington, D. C., by Assistant Commissioner of Education, Dr. Bess Goodykoontz, to deal with industrial arts for low average pupils.

This apparently is a continuation of the original committee which produced the bulletin "Industrial Arts — Its Interpretation in the American Schools."

Mr. Earl Bedell, director of vocational education in Detroit. is a member of this committee.

♦ An industrial-arts course has been added to the curriculum of the Cecil Township High School, Canonsburg, Pa.

♦ The automotive department of the Fordson High School, Dearborn has received a complete 1938 Dodge chassis through the courtesy and cooperation of the Chrysler Corporation. This unit has been assigned to the automotive electrical shop for use in student instruction.

Association News

♦ The Eighteenth Annual Conference on Printing Education held at Columbia University, New York City, June 24–29, sponsored by The National Graphic Arts Education Guild was by far the most successful of its kind ever held. More than 200 teachers of printing and others interested in education for the printing industry were registered. All of the twelve conference sessions were exceptionally well attended.

The conference program, with forty some speakers who gave their services gratuitously, went far toward bringing printing and education in closer cooperation. The University setting, with direct help from the Columbia University authorities, served to call attention to the high favor in which printing education is held in the field of education. A special open air devotional service held on the steps of the Seth Low Library, early on Conference Sunday, was a fitting prelude to the pilgrimage to Frederic W. Goudy's Village Press, Deepdene, Marlboro-on-the Hudson. Mr. Goudy joined the motorcade of 56 cars carrying 189 teachers and friends to West Point, where he addressed the assemblage at the noon luncheon session.

In honor of the conference, the New York World's Fair Committee designated Saturday, June 24, the opening day of the conference, as Graphic Arts Education Day at the Fair. A special meeting, presided over by Ferdy J. Tagle, president of the National Graphic Arts Education Guild, was held in the Little Theatre of the Science and Education Building on the Fair Grounds.

The annual banquet, held at the Faculty Club of the University, was outstanding with 250

(Continued on page 14A)

DISSTON MAKES

the tool for every School Shop need

How to use tools? The right tools to use? Disston has answered these questions for many years . . . by making the tools most needed for school shop use.

Disston also issues charts for the school room and literature of an educational nature for the use of teachers in vocational instruction.

In addition, a service of repairing and refitting saws used as school equipment at nominal cost was adopted years ago in order that schools could get the best possible results from equipment used.

Write us about this Disston vocational service. Samples of Disston Hand Saw Chart, File Chart and Hack Saw Chart, and educational literature will be sent to instructors upon request.

HENRY DISSTON & SONS, INC., PHILADELPHIA, U. S. A.

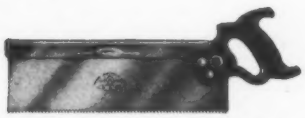
ESTABLISHED 1840 — REG. U.S. PAT. OFF.

At right is shown miniature reproduction of Disston Hand Saw wall chart, 17" by 22" in size. Similar charts on Files and Hack Saws are available to instructors.

A Few Useful Disston Tools

D-8 REGULAR PATTERN, Skew-Back Hand Saw. 20, 22, 24 and 26 inches. Also made in Lightweight Pattern in 26", differs in width of blade only.

D-7 REGULAR PATTERN, Straight-Back Hand Saw. 20, 22, 24 and 26 inches. Also made in Lightweight Pattern in 26".

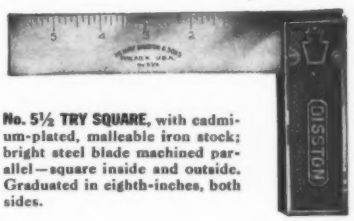


No. 4 BACK SAW, the handiest of all saws for cutting mitres, grooves, tenons, mouldings and other shop work requiring accuracy. 8 to 16" inclusive.

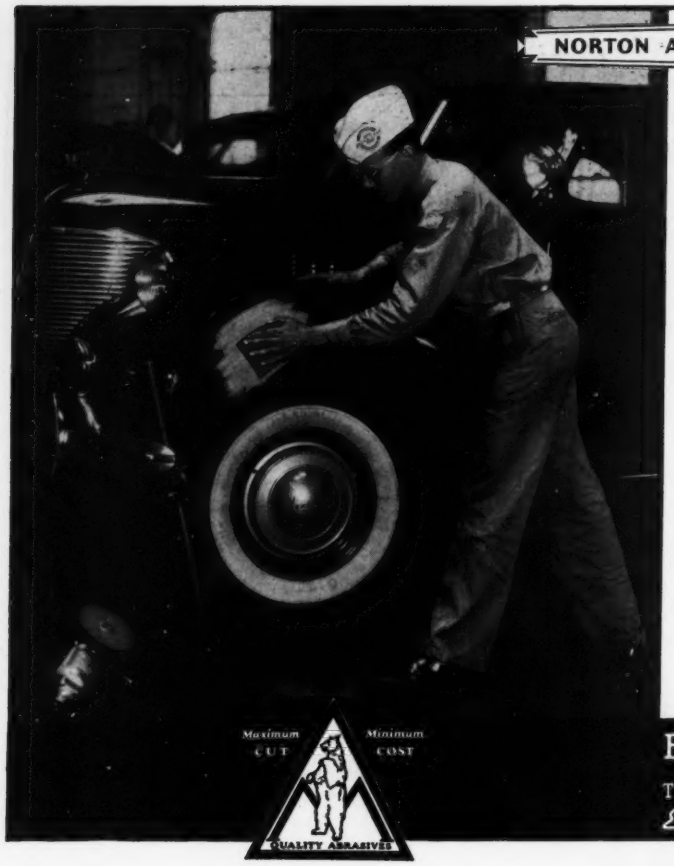
No. 10 COPING SAW, with frame of Disston Steel. Blades available for cutting wood, bakelight, celluloid, bone and composition board.

No. 76 MARKING GAUGE, made of hardwood, with graduated stem. Adjusting screw bears against brass plate in head to prevent wear.

No. 2 BEVEL, with Disston Steel blade; tempered; blued finish. Rosewood handle fitted with heavy brass face plates.



No. 5½ TRY SQUARE, with cadmium-plated, malleable iron stock; bright steel blade machined parallel—square inside and outside. Graduated in eighth-inches, both sides.



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Lightning* Metalite Cloth Handy Rolls
Narrow strips—with straight, non-ravelling edges—for cleaning and polishing shaftings and small, intricate surfaces.

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For portable machine sanding—"tougher than any metal job you'll ever get!"

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For hard-to-get-at places that can't be sanded properly with a disc.

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For dry or oil sanding of bare metal.

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Unexcelled for piston grinding, valve grinding and a multitude of other applications in the auto repair shop.

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In every conceivable shape and size for all manner of sharpening, filing and honing operations.

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(DIVISION OF NORTON COMPANY)
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Educational Service Department

(Continued from page 12A)

enjoying the affair. At this meeting Dr. William E. Grady, associate superintendent of schools of New York City was presented with the Scroll of the National Graphic Arts Education Guild for distinguished service in the cause of national printing education. The award of the American Type Founders Cup to the student club that prepared the best scrapbook of printing specimens was made by Thomas R. Jones, president of ATF, to a student club of the Masonic Home and School, Fort Worth, Texas. The annual keepsake, this year a handsomely printed booklet, "The William Parks Paper Mill at Williamsburg," prepared by C. Harold Lauck, Washington and Lee University, Lexington, Virginia, was distributed.

Among the leaders of industry who took part in the various conference sessions listed in the order in which they appeared on the program are: George H. Carter, Lanston Monotype and Machine Co.; Edward W. Edwards, New York Federation of Labor; Frederic W. Goudy, Type Designer; O. Alfred Dickman, Advertising Production Manager, New York Herald Tribune; Don H. Taylor, New York Employing Printers Association; William H. Friedman, Carey Press Corporation, New York City; Dr. Robert L. Leslie, Composing Room, Inc., New York City; Harry L. Gage, Vice-President, Mergenthaler Linotype Company; Elmer J. Koch. Secretary, United Typothetae of America; and Thomas R. Jones, President, American Type Founders. One complete session was devoted to a symposium on Industries' Cooperation with Graphic Arts Education. Ten members of the newly organized Advisory Council on Graphic Arts Education took part in the symposium.

Two important resolutions applying to relations with industry were adopted at the business meeting. The one authorized the officers to take steps to have corrected in the Printing Trades Blue Books that school shops are private plants. The other was a recommendation "that products manufactured in America be used in our school print shops and in our Guild work exclusively." It was voted to hold the 1940 Convention at the Rochester Athenaeum and Mechanics Institute in Rochester, New York.

The newly elected officers for the school year 1939–40 are:

Officers: President, C. Harold Lauck, Washington and Lee University, Lexington, Virginia; Vice-President, Fred W. Miller, Masonic Home and School, Fort Worth, Texas; Secretary, Leonard Petersen, West High School, Green Bay, Wisconsin; Treasurer, E. S. French, Woodrow Wilson High School, Washington, D. C.; Educational Director, Fred J. Hartman, 412 National Savings and Trust Building, 719 Fifteenth Street, N. W., Washington, D. C. — *Fred J. Hartman.*

♦ Oshkosh, Wis., was host to the Wisconsin Association for Vocational and Adult Education in its Fourth Annual Convention, May 5 and 6. Eleven hundred members were in attendance which is further evidence that the separate meeting of vocational people tends toward increasing the interest of members in promoting the work for which the association was founded. Thirty-three exhibitors displayed their wares and provided an opportunity for the delegates to become informed concerning latest commercial and industrial developments, and to examine the latest in text and reference materials.

A brilliant array of guest speakers high-lighted the convention. Among them were: Dr. Edwin A. Lee, Dr. G. W. Crane, General Smedley D. Butler, Dr. Mary Lyle, Dr. R. L. Cooley, Dr. Katherine Taylor, and Mr. Henry Pfizennayer.

C. W. Illingworth, Racine, and Wm. A. Brazier, Milwaukee, were re-elected President and Secretary-Treasurer respectively. Merlin Brose, Manitowoc; Katherine Schultz, La Crosse; J. G. Childs, Sheboygan, were elected to the Executive Board, representing Commercial Homemaking, and Co-ordination respectively.

Resolutions were passed pertaining to present legislative measures, and one memorializing the late E. E. Gunn, assistant state director of vocational and adult education for the State of Wisconsin.

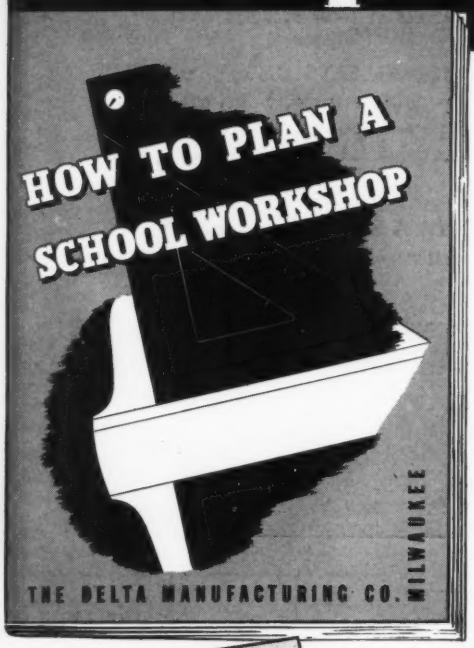
The program of general and sectional meetings in brief follows: At the general meeting, Dr. G. W. Crane of Northwestern University spoke on "Housecleaning in Education," and Dr. Edwin A. Lee of the University of Columbia, on "Vocational Education and the Current Scene." At the banquet, General Smedley D. Butler, U. S. Marines, Retired, presented the topic, "America, Mind Your Own Business." At the adult education section, General Smedley D. Butler, Philadelphia, Pa., spoke on, "Education's Need in Light of America's Problems"; Dr. Edwin A. Lee, Columbia University, spoke on "Growing Pains"; Dr. Mary Lyle, Associate Professor, Iowa State College, Ames, Ia., spoke on "Homemaking Education in Adult Programs"; and Dr. R. L. Cooley, Director of Vocational and Adult Education, Milwaukee, Wis., discussed, "Future of Adult Education." Besides the foregoing, numerous sectional meetings were held. — *W. A. Brazier.*

♦ The Industrial-Arts Section of the N.E.A. met for its first session at a joint luncheon with the art section at noon on July 4, 1939, at the St. Francis Hotel, San Francisco, Calif. Chairman at this luncheon was Joseph P. Nourse, Superintendent of the San Francisco Public Schools. Mrs. Dorothy Wright Liebes spoke on "Modern Designers of the Golden Gate Exposition."

The second session held at 2 p.m. July 4, was under the chairmanship of John Brady, President, California Teachers Association and Chief Deputy Superintendent, San Francisco Public Schools. The theme for this session was "The Scope and Functions of Industrial Arts in the Program of General Education," and the speakers for the occasion were: Dr. William E. Warner, President, American Industrial-Arts Association. Professor of Industrial Arts, Ohio State University; Dr. A. A. Douglass, Chief, Division of Secondary Education, California State Department of Educa-

(Continued on page 16A)

Send for this Free Shop Layout Book



PRACTICAL WORKSHOP PLANS TO FIT ALL TYPES OF SCHOOLS

Prepared and submitted by vocational instructors from all over the country — the shop photographs and layouts contained in this new book represent the cream of the hundreds of entries sent in to the board of judges in the recent shop planning contest sponsored by the Delta Manufacturing Company. These are authentic school shop layouts embodying the most ingenious solutions of the problems of space, safety, lighting, convenience and teaching efficiency in both small and large schools. There are actual photographs and floor plans of 30 shops in this attractive 44-page book. Every one interested in vocational instruction should have a copy — and it's yours — FREE — for the asking. Simply fill out the coupon and your copy will be sent postpaid, without obligating you in the slightest.

Also other valuable shop information

In addition to the shop layouts and floor plans, this new book for the first time makes available to instructors important school shop information on all the important new type of industrial power tools. Each tool is listed individually — band saws, circular saws, lathes, jointers, grinders, drill presses, shapers, scroll saws — and separate instructions for the placing and most efficient use of each tool are given.

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STARRETT CATALOG No. 26 CE describes the complete line of Starrett Tools and Hacksaws for school and shop classes.

STARRETT EDUCATIONAL SETS show how to use the essential precision tools. Fourteen 8 x 10½ blue-printed pages, punched to fit a standard notebook. Furnished at cost—10 cents per set.

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(Continued from page 14A)

tion; Dr. John Almack, Professor of Education, Stanford University; Mr. Will Mathews, Supervisor Industrial Arts, Oakland Public Schools; and Dr. M. M. Proffit, Specialist Industrial Education, United States Office of Education. The subject treated by the various speakers were: "The Underlying Philosophy of Industrial Arts"; "The Industrial-Arts Curriculum"; "The Teacher-Training Program"; "The Physical Setting for the Industrial-Arts Program"; and "Industrial Arts from the National Viewpoint" respectively.

The theme chosen for the third session held at 2 p.m., July 5, was: "The Industrial-Arts Program in Action." Dr. T. W. MacQuarrie, President, San Jose State College, San Jose, Calif., presided. The speakers were: Dr. John Whalquist, Professor of Education and Director of Training, University of Utah; Mr. Claude Nihart, Supervisor, Vocational and Practical Arts, Los Angeles Public Schools; Mr. Perry Stratten, Industrial-Arts Instructor, Elementary Schools, Mountain View, Calif.; Mr. Lewis Deasy, Supervisor of Industrial Arts, Public Schools, Santa Clara County, Calif.; and Professor George B. Cox, Head of Department of Industrial Education, Oregon State College. Their subjects were: "The Activity Program and Industrial Arts in the Elementary School"; "Industrial Arts in the Secondary School"; "The Industrial-Arts Program in the Smaller Town and Community"; "A County Program of Industrial Arts"; and "Industrial Arts for College, Adult, and Special Groups" respectively.

♦ The industrial-arts department of Southwest Texas State Teachers College recently organized an Industrial-Arts Club in the interest and expansion of progressive work in the industrial-arts field.

The club had its first meeting on Tuesday, March 20, at which time Dr. Hugh F. Seabury addressed the group on benefits to be derived from school clubs.

A constitution was also discussed and the following officers were elected to serve during the remainder of the school year: Fritz Linnstaedter, president; Roland Miller, vice-president; Ray Goodnight, treasurer; William Deck, secretary; and Warrick Vaughn, reporter.

H. U. Miles, head of the industrial-arts department, will serve as sponsor.

A call meeting on March 29 extended membership of the club to 20 active members. Plans are being made for a field trip to various school systems and industrial plants in the vicinity.

The club shall endeavor to give an added growth to the department with plans of affording much more practical experience in industrial and vocational fields.

♦ The Massachusetts Industrial Education Society held its annual outing in conjunction with the Industrial Arts Association of Worcester County at Mount Pleasant House, Jefferson, Mass., on Saturday, June 3, 1939. Sports of all kinds were indulged in.

The following officers were elected for the coming year: President, Gustave A. Larson, Malden; Vice-President, Daniel J. Sullivan, West Roxbury; Secretary, Joseph Rains, Boston; Treasurer, A. Irving Dodge, Lexington; Librarian, Joseph Slyva, Hyde Park.

Mr. G. A. Larson, President of the Association for 1939–40, is employed by the Malden School Department. He is a graduate of the Fitchburg State Teachers College, Boston University School of Education. Before going into the teaching field, his industrial connections were with Simmons Saw and Steel Co.; Manning, Maxwell and Moore; and the Bethlehem Ship Building Corporation.

♦ Industrial-arts and vocational-education teachers, supervisors, directors, and administrators should begin to lay their plans for attending the 1939 American Vocational Association convention at the Pantlind Hotel, Grand Rapids, Mich., Dec. 6–9.

♦ The second Four-State Regional Conference will be held Oct. 6 and 7, 1939, at the Kansas State Teachers College, Pittsburg, Kans.

On Oct. 5, 1939, at the same place, a conference of Evening-School Directors will be held.

♦ The Second Annual Meeting of the faculty and students of the industrial-education department of the University of Maryland, College Park, Md., was held in connection with a banquet at the Lord Calvert Inn, College Park, Tuesday evening, August 1, 1939.

The theme of this dinner meeting was "Trends." Integration of industrial arts with general education and guidance was emphasized.

Ninety-four guests were present. Among the guest speakers were: Mr. John J. Seidel, Director of Vocational Education for the State of Maryland; Mr. Charles W. Sylvester, Director of Vocational Education for Baltimore City; Mr. Harold A. Clark, Director of Vocational Education for Washington, D. C.; Mr. Glen D. Brown, Professor of Industrial Education at the University of Maryland; Mr. R. F. Cromwell, Supervisor of Guidance for the State of Maryland; and Mr. G. C. Cooling, Principal, Allegany County, Md.

The meeting was presided over by Arthur A. Dick, as chairman and student representative.

In the afternoon, preceding the dinner meeting, emphasis was placed on the exhibiting of work done during the summer session in shop classes.

The interest shown at the exhibit and at the dinner meeting, is justification for making these events annual affairs. The complete success of these affairs is indicative of the development and expansion of the industrial-education department of the University of Maryland. — *Arthur A. Dick.*

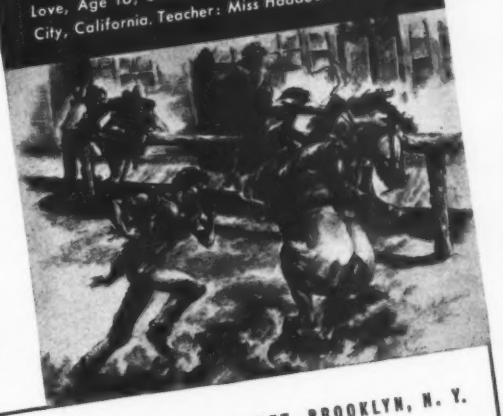
♦ The Fordson Aero Club, under the sponsorship of L. C. Wines conducted its annual Junior High School airplane contest, April 20. More than thirty boys participated in the flying scale and solid scale model events. Judges selected five places in each event and model airplane kits were offered. This contest was one of a series sponsored by chapters of the Future Craftsmen of America.

PRIZES and HONORS — are open to those who enter the 1940 drawing competitions sponsored by **HIGGINS** under the Scholastic Awards

For 1940, the 11th consecutive year of the Chas. M. Higgins Memorial Awards, there is an innovation in the projects in the Mechanical Drawing Division. One project is the design of a "Soap Box Derby" racer and the other is open — you may submit any classroom problem or work up an original idea, as you prefer. There are, of course, the usual Higgins prizes in the Black and Colored Drawing Ink Divisions of the Free-hand Competition. Full details and how to enter these contests are published in the October 9th issue of "Scholastic", or write us for folder giving complete information.

Be sure to enter. Besides the prizes to be won, the exercise of your talents for a purpose will give you valuable experience — and a plus in all your school work — that is worthy of your best efforts. Ask your drawing teacher about the Chas. M. Higgins Memorial Awards, today.

FIRST PRIZE — Black Drawing Ink Division, Free-hand Competition, 1939. Drawn by Maureen Love, Age 16, Sweetwater High School, National City, California. Teacher: Miss Haddock.



HIGGINS CHAS. M. HIGGINS & CO., INC. • 271 NINTH STREET, BROOKLYN, N. Y.

New Products

Heavy-Duty Carter Bench Shaper

Bench Shaper No. C51 has just been announced by The R. L. Carter Division, New Britain, Conn. A one h.p. combination router-shaper motor, 18,000 r.p.m., is held under the table in a holder which can be tilted from a vertical position to any angle up to 45 deg. With the motor tilted to various angles and with three cutters used singly or in combinations of 2 or 3, it is possible to make over 500 different kinds of cuts.

The table top provides a working surface large enough for practically all shaping work. It measures 16 by 26 in. The table is made so that wood extensions can be attached, if additional surface is needed.

The table top is also drilled to accommodate an adjustable straight fence, tension shoe, light fixture, and circular guide. The cast-iron legs have drilled bolt holes for anchoring the shaper to a bench.

A regular switch is on the right front leg. An overload switch which throws out the regular switch, stopping the motor when it is overloaded, is also on the front of the table.

The same motor used in C51 Bench Shaper can be used in a plain base for routing, grooving, veining, inlay, and template work. An adapter can be used in place of the shaper spindle to take router bits.

New Porter-Cable Edger

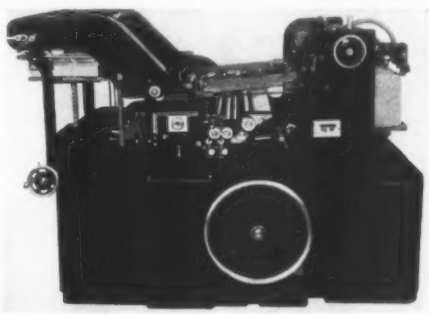
In answer to the continued demand from floor surfacers for a more powerful, yet lighter weight edger, this new 7-in. edger was designed by the Porter-Cable Machine Co. of Syracuse, N. Y. It is equipped with a universal motor listed at 1¼ h.p., yet capable of a much higher overload, and has a frame of cast aluminum, bringing the total weight down to 24 pounds.

Other features included are a flat top for convenience of disk changing; quickly detachable dust bag with zipper opening and beater for cleaning; chromium-plated, hardened steel disk guard; ball-bearing, adjustable and shielded roller casters; insulated handles; twist-lock cable connectors; and built-in electric floodlight. The Type AE-7 edger is 12½ in. high by 10 in. wide at base. The same high quality of materials and construction used in more expensive Porter-Cable sanders has been used throughout in this powerful, yet lighter edger.

The Kelly Clipper

The American Type Founders Sales Corp., Elizabeth, N. J., are marketing the Kelly Clipper, a press which was designed to embody the suggestions of thousands of pressmen who outlined what they wanted in an ideal press.

The press is built to facilitate a speedy get-away, give free access to the cylinder, has a feeder that can be quickly and accurately set, is designed to give a uniform ink distribution with rolls that can be set easily, registers accurately, can be washed up speedily, is strong and durable, and has every device needed for high production speed and ease of manipulation.



While this is primarily a production machine, yet it will readily find a place in vocational and trade-training schools. For more explicit information, instructors should write directly to the manufacturers.

(Continued on page 18A)

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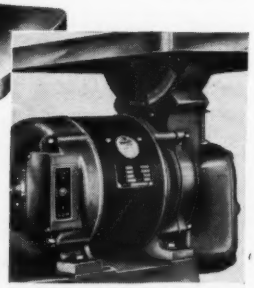
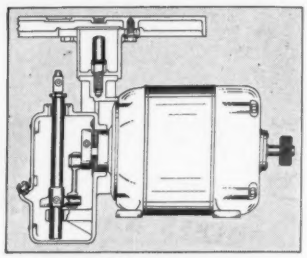
SERVICEABILITY
WIDE USEFULNESS

Compare this 24" Vari-Speed Direct Drive Jig Saw point for point with any jig saw on the market. You'll see why it is standard equipment in the better school shops.

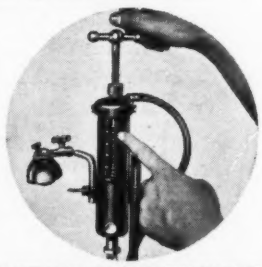
MJ 917 — 24" JIG SAW
including Vari-speed motor and lamp.
$48.50



Fingertip Control for Instant Speed Change without stopping the motor.



DRIVING MECHANISM
Similar to crankshaft, connecting rod and piston action of an automobile engine — the most efficient jig saw drive known.



INSTANT BLADE TENSIONER
To assure vibrationless operation of different sizes of blades while machine is running.

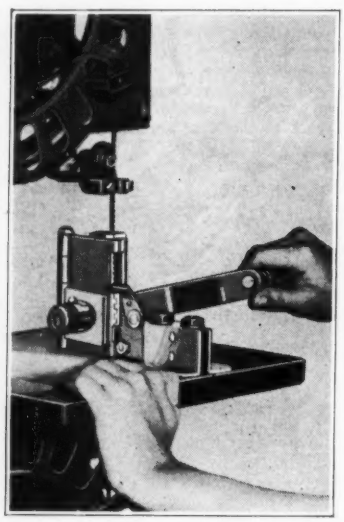
Send for Walker-Turner Catalog.
Walker-Turner Co., Inc., 19109 Berckman St., Plainfield, N. J.

WALKER-TURNER *Engineered* POWER TOOLS

(Continued from page 17A)

K. B. Band-Saw Set

K. B. Devices Co., Geneseo, Ill., are marketing a novel band-saw set which will accurately reset a band saw in from three to five minutes without removing the blade from the wheels.



This saw set is so simple that the work of setting band saws may be safely left in the hands of the students. They will have no trouble in setting up the device on the saw table after which the teeth will be set with precision to the tooth angle specified by the factory.

The set is built with interchangeable 5-, 6-, and 7-pitch jaws. It will handle blades from ⅛ to 5/8 in. wide.

Model BB–10, Take-About Sander-Grinder

Several features necessary for greater production and superfinish are incorporated in the latest model Take-About Sander, announced by Porter-Cable Machine Company, Syracuse, N. Y.

This machine operates at a higher belt speed, and has more power. It is balanced four ways, easier to handle and to obtain a true finished surface.

The dust-collecting system of the new model, consisting of a double fan driven by ample power, is more effective. The BB–10 is practically dustless. Ventilation also has been improved to obtain a cool operating unit.

Belt change is expedited by the new lever control. Correct tension on the belt at the new high speed is maintained automatically. A silent chain drive delivers more power to the point of work and provides a quiet running machine.

This grinder may be used on a variety of materials: wood, metal, stone, glass, plastic materials, and the like, for manufacturing, finishing, maintenance, and repairing operations.

Manufacturers' PUBLICATIONS

The Wrot Iron Designers, 541 West 35th St., New York City, have just issued catalog L which illustrates and describes tools, materials, designs, and kits for leathercraft and metal-foil repoussé.

Besides these two activities, which have been lately added to the offerings of this firm, the catalog lists finishing supplies, books, art metal and wrought iron, finger painting, Tempola craft, a model-V bottom sloop, a whittling project and beadcraft.

Wrot Iron Designers also offer free advisory and consulting service.

The American Gas Furnace Co., Elizabeth, N. J., have just issued their Catalog No. 601 which features the small appliances in the field of furnaces and burners manufactured by this firm.

In it are described fishtail burners, blowpipes, venturi mixers, ribbon burners, muffle furnaces, convertible bench forges, gold and silver melters, melter and pot hardening furnaces, soldering-iron heaters, flow meters, toolroom and high-speed furnaces, pot tempering furnaces, pyrometers, and blowers and compressors.

The catalog also contains a temperature conversion table, a hardness and tensile conversion table, a pressure conversion chart, and a table of heat and temper colors.

The Frederick Post Co., Chicago manufacturer of drafting instruments, is ready to release a wall chart that will greatly assist the college and high-school drafting instructor in classroom work.

Through the cooperation of Professor Thomas E. French, author and noted authority on draft-

(Continued on page 23A)

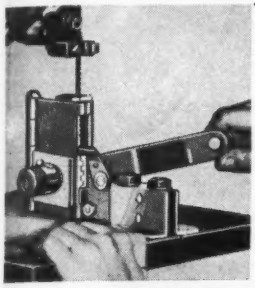
ART METAL WORK

is one of the most popular crafts in school work.

We specialize in equipments and supplies. When ordering hammers and anvils specify "Rose".

Send for a sample copy of our brochure "The Metal Crafts" and mention this magazine. It is full of helpful suggestions for teachers.

METAL CRAFTS SUPPLY CO.
37 Aborn St., Providence, R. I.



YOU NEED A K-B BAND SAW SET IN YOUR WORKSHOP!

The acme of perfection in simplicity of modern inventions. It accurately resets your band saw in three to five minutes without removing blade from wheels. Interchangeable jaws are obtainable for five, six, or seven pitch blades from 3/16" to 5/8" in width. Constructed of carborized steel and sunite metal with beautiful cadmium finish, this new precision band saw set guarantees perfect setting.

Price complete with one set of jaws $15.00
Extra jaws - - per set $ 5.00
Specify pitch and make of band saw unit with order.
Descriptive folder mailed upon request.

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"Westko Modeling Clay"

This clay is used in Schools and Art Institutions throughout the United States.

Write for prices and information

Western Stoneware Co.
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DIXON MANUAL FOR METAL ARTISTS
30 Folio Pages with 48 Projects in Art Metal, Jewelry and Wrought Iron, with Instructions. Price $1.50
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OUR COMPLETE ARTS and CRAFTS CATALOG IS FREE TO INDUSTRIAL ARTS TEACHERS AND TO CRAFT COUNSELORS
WILLIAM DIXON INC.
32-36 EAST KINNEY STREET, NEWARK, N. J.

(Continued from page 18A)

ing, together with his publishers, the McGraw-Hill Book Co., Post has produced a lithographed classroom wall chart which illustrates a complete range of drafting instruments suitable for student use and details in diagram and drawings the fundamental principles of drafting technique.

On the reverse side of the classroom chart accessories of the drafting room are illustrated together with illustrated basic drafting exercises, the line alphabet, details of faulty lines and many other pertinent and suggestive topics which will stimulate the student to greater cooperation with the instructor.

These wall charts are available *free* to all school and college drafting instructors through all Post dealers, or directly from the Frederick Post Co., Box 803, Chicago.

ALBERT CONSTANTINE AND SON, INC., 797 East 135th St., New York City, have just issued their 1940 catalog.

This "Bargain Book for Wood Workers" lists and describes the veneers, inlays, panels, lumber, turning squares, inlaid borders, turning blocks, special woods, tools, veneer presses, and glues which this firm markets.

The catalog also contains considerable information on veneering, gluing, inlaying, and finishing. Of special interest to woodworking instructors is the announcement of a newly made motion picture of the woodworking industry. This describes not only the manufacturing processes necessary to put wood on the market, but also how glue is made and used, and how veneers are produced and utilized.

A number of books which will interest and help the instructor as well as the home craftsman also are listed.

ARMSTRONG BROS. TOOL CO., "The Tool Holder People," Chicago, have just issued their general catalog, No. C-39. This describes the full Armstrong lines which include: "Armstrong" Tool Holders; carbon, chrome-vanadium, and detachable-head socket wrenches; C clamps; lathe and milling-machine dogs; turret-lathe and screw-machine tools; ratchet drills; bits, blades, and high-speed steel; setting-up tools; machine-shop specialties, and "Armstrong Bros." pipe tools.

THE CARLYLE JOHNSON MACHINE CO., 52 Maine St., Manchester, Conn., have just issued a catalog covering their Johnson Friction Clutches. In it are described the various sizes of single and double clutches manufactured by this firm.

An information sheet which is to be filled out by the customer, and a detailed dimension sketch of all the different sizes of clutches obtainable from the firm, have been made part of the catalog.

Buyers News

Production capacity at ATLAS PRESS COMPANY, Kalamazoo, Mich., has again been increased by a recent plant addition which provides new working area of 17,000 square feet. The added floor space will step up manufacture of the company's lathes, shapers, drill presses, and arbor presses. An addition of approximately the same size was completed in November, 1937.

THE U. S. PLYWOOD CORP., 618 West 46th St., New York City, are offering an assortment of 45 wood veneers representing the pick of the world's forests. The wood veneer samples are labeled with the name of the wood, its source, and botanical name. The assortment is contained in a convenient kit. The cost of the set is $1.39 postpaid.

BEHR-MANNING CORPORATION, Division of Norton Co., Troy, N. Y., have issued 8 pages of loose-leaf illustrative and descriptive material on "Mounted Points and Wheels."

This material contains fully dimensioned sketches of the different mounted points and wheels commonly stocked by this firm.

While this information seems to be prepared specially for dealers handling this kind of equip-

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FOR SPINNING

Circles—2" to 20" dia.—14-15-16-18 ga.
Sheets—18"x24"—12-14-15-16-18 ga.
Square Wires—⅛"-3/16"-¼"-5/16" approx. sizes
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Hinges—1" and ⅝"
Slugs—1¼"-1"-⅞"-¾"—dia. (in any thickness)
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65/35—Half Round
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HANDEE TOOL OF 1001 USES

FOR EASIER TEACHING

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A complete and practical outfit for use with DeLuxe Handee — Lathe, Drill Press, Routers, Carver, Grinder, Polisher, Sanders, Saw, Shaper Table and 10 Accessories all for $35.00 delivered.

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are of two types—the Spring Threading Tool especially designed for new tougher alloy steels and the ARMSTRONG Threading Tool that takes form cutters that require only top grinding to resharpen — always hold true thread profile.

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REAL Quality Tools

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The Handbook of Vocational Opportunity
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22 inspiring discussions of fundamental trades opening on 60 specialized careers. Written by 22 experts who draw on their experience for the guidance of young men in vocational work.

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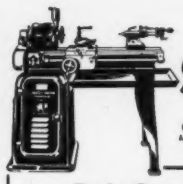

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For schools no lathe equals a Sheldon 4-speed Type "U" Underneath Pedestal Drive. Full bowl headstock and cabinet leg enclose all belts and pulleys. Speed changes are made by external shift levers, and cabinet is opened only for occasional oiling.

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Grinding can be done on a cone, coarse or fine oilstone, leather stropping or emery wheels. Unit is compact, efficient, serviceable, easily accessible and has ball bearing direct motor drive. Especially guarded for school shop use. Details on request.

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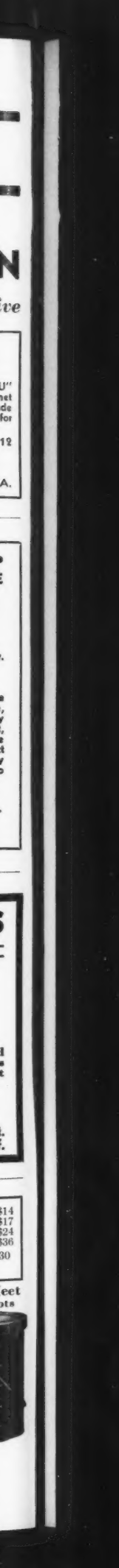
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